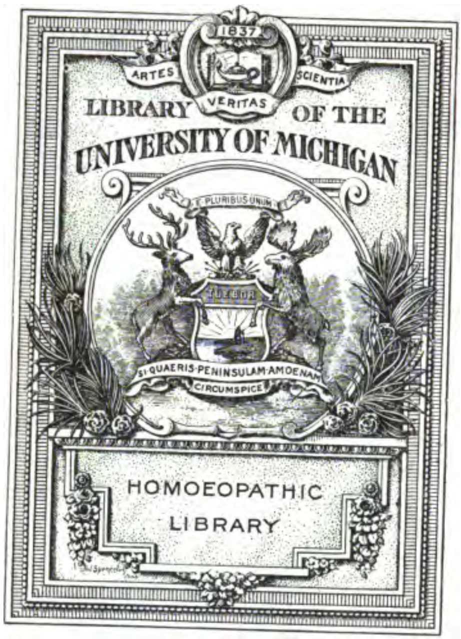
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A HANDBOOK FOR NURSES

97

BY

J. K. WATSON, M. D., EDIN.

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AMERICAN EDITION

UNDER THE SUPERVISION OF

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PHILADELPHIA
W. B. SAUNDERS
925 WALNUT STREET
1900

PREFACE TO THE AMERICAN EDITION.

Dr. Watson's hand-book has so many excellent qualities that no apology is needed for introducing it to those who are engaged in the study of nursing in this country. The question of scope in a book of this character is always a trying one to solve; there is danger in offering too much or too little. But in this instance the author has exercised such rare discretion in the selection of material that his work is to be commended as not being too profound for the needs of the nurse, nor yet too superficial to be of practical value.

A. A. STEVENS.

Dedicated

(BY PERMISSION)

TO

JOHN CHIENE, M.D.

PRESIDENT OF THE ROYAL COLLEGE OF SURGEONS, EDINBURGH

AND PROFESSOR OF SURGERY IN THE UNIVERSITY

OF EDINBURGH

PREFACE.

IT has been my endeavour, in adding yet another to the already numerous text-books which are now on the market, to supply in one volume that information which so many nurses at the present time are trying to extract from various medical works, and to present that information in a suitable form.

I shall abstain from discussing the vexed question as to how much medical knowledge we should impart to our nurses, but suffice it to say that I have found many nurses possessing medical books from which they could derive but doubtful benefit. We cannot prevent nurses from attempting to acquire a certain amount of medical knowledge; and if we could, I should be no party to such a procedure. What we should rather aim at is to judiciously cater for this appetite, and to use our influence to prevent the illegitimate use of such knowledge. It is common experience that the more highly qualified is the nurse the less likelihood is there of her attempting to usurp the *rôle* of the medical man; it is the ignorant and the badly trained nurse who thus brings discredit on her nursing-sisters.

In such a work as this it is a difficult question to decide what is to be inserted and what omitted, and

I am only too conscious of the imperfections with which the work abounds in this respect.

I have purposely omitted the mention of skin diseases, chiefly on account of the difficulties with which this subject is surrounded.

I would point out, too, that the subject of nursing *per se* has been confined to one chapter.

Those illustrations which have not been specially prepared have been acknowledged in each case.

My thanks are especially due to my old friend Dr. F. W. Eurich for kindly reading over the manuscript, and for his valuable advice thereon; to Professor Chiene, my esteemed teacher, for his permission to dedicate this work to him; and to Nurse Katharine Nutt.

J. K. W.

BYFLEET, SURREY,
August 1899.

CONTENTS.

PART I.

PART II.

A HANDBOOK FOR NURSES.

PART I.

CHAPTER I.

THE SKELETON: ITS ARTICULATIONS AND THE MUSCLES CONNECTED THEREWITH.

THE fully developed skeleton consists of two hundred bones, which vary in shape, size, and structure, according to the purpose which they are intended to serve. **Number of bones in the body.**

The skeleton constitutes the framework of the body, and protects the vital organs contained in the cavities of the head, chest, abdomen, and pelvis.

At an early stage of development (six months before birth) the skeleton consists of membrane and cartilage, popularly known as gristle.

The membranous part of the skeleton has disappeared in man, and the cartilaginous part nearly so, to be replaced by bone.

Bone combines the qualities of hardness with toughness, lightness, and a certain degree of elasticity. **Qualities of bone.**

If we were to examine into the structure of such a bone as the thigh-bone (femur), we should find it to be composed of two kinds of tissue—an outer layer of compact hard material, and an inner spongy substance in the form of a lattice-work, and therefore termed cancellous bone. The former layer gives to the bone its necessary strength, the **Its structure.**

latter its lightness. Inside such a bone as we are now considering is a canal, which contains the bone-marrow.

Periosteum. Covering the bone is a membrane called the periosteum (Gk. *peri*, around; *osteon*, bone), from which it derives its chief nourishment; for when the bone is stripped of its periosteum the affected part dies—this is known as necrosis. The ends of the long or cylindrical bones are covered with gristle (cartilage), which allows them to move freely and smoothly over each other.

Spinal column: its importance in comparative anatomy. It is customary in describing the skeleton to commence with the spine, which is a flexible column composed of irregularly shaped bones called vertebræ (Lat. *vertere*, to turn).

In classifying the members of the animal kingdom the presence or absence of the vertebral column is made use of, and thus arises the first broad division of animals into Vertebrata and Invertebrata. The spinal column, then, is of the greatest importance in the study of what is known as comparative anatomy—the science which deals with the study of the structure of the lower animals, as compared with that of the highest member of the animal kingdom, man himself. In man the axis of the spine is vertical, which gives to him one of his most marked characteristics—namely, the erect attitude. Some of the monkeys (man-like apes), such as the gorilla or chimpanzee, approach man in this respect, having their spine semi-erect; but the spinal axis in the lower animals is more or less horizontal.

Number of vertebræ: their names. The number of the vertebræ is thirty-three; they are divided into five groups, according to the region which they occupy—namely, cervical or neck vertebræ, dorsal or back, lumbar or loin, sacral, and coccygeal. The cervical region contains seven, the dorsal twelve, the lumbar five, the sacral five, and the coccygeal four. The vertebræ in the two last regions are in adult life united to form two bones, the sacrum (sacred bone) and the coccyx (so called from its resemblance to a cuckoo's beak), so that the number of vertebræ is now reduced to twenty-six. The sacrum is made up of the five sacral vertebræ, and the coccyx of the four coccygeal.

Sacrum. **Coccyx.**

Curves of the spinal column. Between the vertebræ are discs of cartilage, to which the curves of the spinal column are largely due. These curves, when the spine is viewed laterally, are seen to be three in

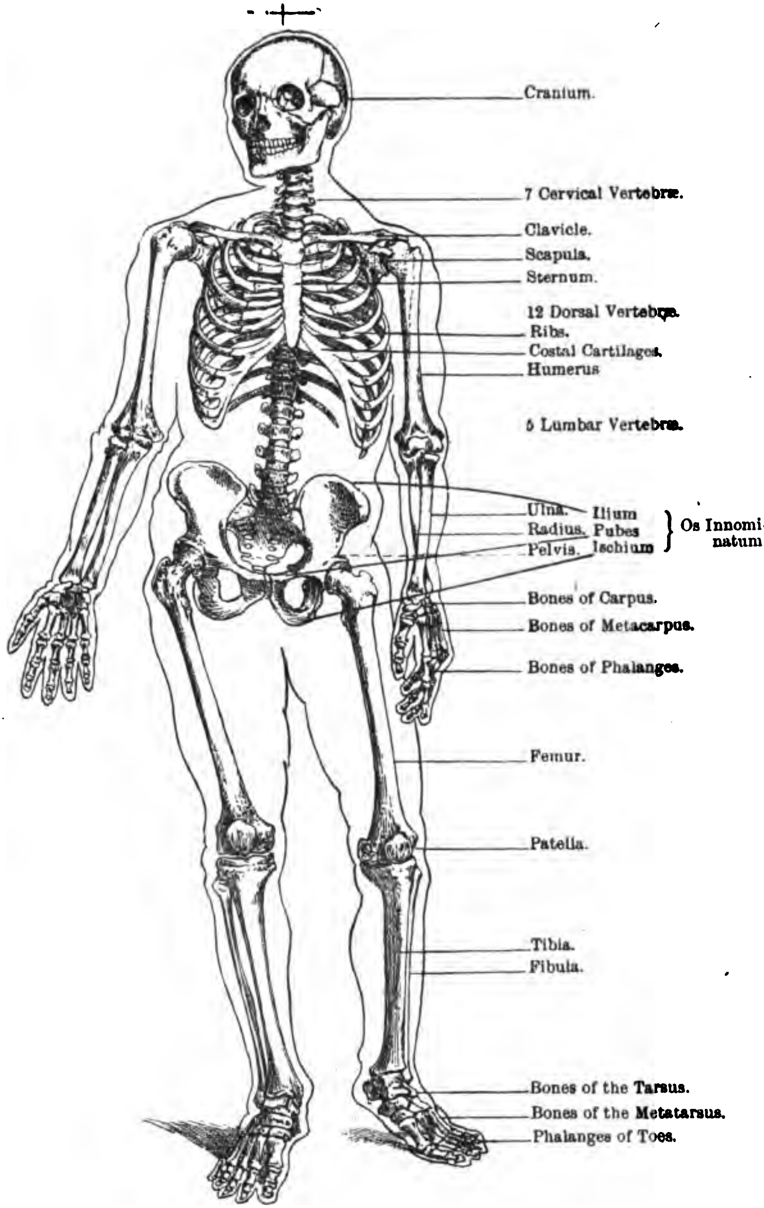


FIG. I.—THE SKELETON.

number, one in each of the first three regions. The cervical and lumbar curves are directed forwards, that in the dorsal region backwards. Movement in the cervical and lumbar regions is for the most part free; in the dorsal region it is very limited.

Parts of a vertebra. Each vertebra is made up of two parts—an anterior solid segment, and a posterior hollow segment or arch. The solid parts of the vertebræ are piled one on the other to form the column of the spine; while the arches form a hollow cylinder (spinal canal), which contains the spinal cord, an important part of the nervous system. **First cervical or atlas vertebra.** The first cervical vertebra receives a special name; it is called the atlas, because it supports the weight of the head as Atlas was supposed by the ancients to support the earth. To the dorsal vertebræ are connected the twelve pairs of ribs.

Skull: its two divisions. Frontal bone. Occipital bone. Parietal bones. Temporal bones. Sphenoid. Ethmoid. The skull is divided into two parts—(1) the cranium, and (2) the face. The cranium is a somewhat oblong box, which contains the brain. It consists of eight bones; in front is the forehead or frontal bone; behind, the occipital bone (Lat. *ob*, against; *caput*, the head). The roof is formed in greater part by the two parietal bones (Lat. *paries*, a wall), right and left; and the floor by part of the temporal bones, right and left, the sphenoid, the ethmoid, and parts of the frontal and occipital.

The bones of the face are fourteen in number.

Nasal bones. The nasal bones are two small bones which form the bridge of the nose.

Superior maxillæ. The two superior maxillæ (Lat. *maxilla*, the jaw-bone) are the largest bones of the face, except the inferior maxilla. Together they form the upper jaw, and carry the upper teeth. They are important bones, because they assist in the formation of three cavities—that of the mouth, the nose, and the orbit or eye-socket. Again, they are liable to many diseases.

Lachrymal bones. The lachrymal bones (Lat. *lachryma*, a tear) are the smallest bones of the face. Lying at the inner part of the orbits, they are closely related to the lachrymal or tear apparatus.

Malar bones. The malar or cheek-bones (Lat. *mala*, the cheek) form the prominence of the cheek on either side.

Palate-bones. The palate-bones, together with part of the superior maxillæ, form the roof of the mouth.

Inferior turbinated bones. The inferior turbinated bones (Lat. *turbo*, a whirl) form part of the walls of the nasal cavities. Each consists of a layer of spongy bone curled upon itself.

There remain two single bones—namely, the vomer, and the inferior maxilla.

Vomer. The vomer (Lat. *vomer*, a ploughshare) forms part of the septum, or partition of the nose.

Inferior maxilla. The inferior maxilla is a powerful horseshoe-shaped bone which carries the lower teeth. It is joined to the skull by a joint between it and the temporal bone, which allows of free movement of the lower jaw upon the upper.

The spinal canal is continuous with the cranium through a large hole (foramen magnum) in the occipital bone.

The following table gives the names of the bones of the skull:—

Skull, twenty-two bones	Cranium, eight bones	Occipital
		Two parietal
		Frontal
		Two temporal
		Sphenoid
		Ethmoid
	Face, fourteen bones	Two nasal
		Two superior maxillæ
		Two lachrymal
		Two malar
		Two palate
		Two inferior turbinated
		Vomer
		Inferior maxillæ

Auditory ossicles. There are, in addition to the bones of the skull, already enumerated, certain little bones, named the auditory ossicles, three in number, which form part of the organ of hearing. They are known as the malleus (hammer), incus (anvil), and stapes (stirrup).

Hyoid bone. There is a small bone (the hyoid bone) to be felt in the neck just below the floor of the mouth, in the middle line. It is shaped like a horse-shoe, and supports the tongue, giving attachment to its numerous muscles.

Thorax. We now pass on to the thorax, or chest, which is a somewhat conical-shaped cavity, whose walls are constituted

partly of bone and partly of cartilage. It contains the principal organs of respiration and circulation.

In front is the breast-bone (sternum), to which are attached the first seven pairs of ribs (true ribs) by cartilages (costal cartilages). The lower five pairs (false ribs) are not attached to the sternum—the upper three being connected to the cartilages, and the last two lying free in front (floating ribs).

The sides of the thorax are formed by the ribs, separated from one another by spaces (intercostal spaces), which are filled in by muscles. The back of the thorax is formed by the twelve dorsal vertebræ, with the hinder ends of the ribs.

On looking at the chest as a whole, we see that the front-to-back (antero-posterior) is less than the side-to-side (transverse) diameter. The reverse holds good in the lower animals.

The chest is liable to many variations in shape, arising constitutionally or acquired by bad habits. We are accustomed to speak of a "well-formed" and a "badly formed" chest.

Upper limbs. The upper limbs are connected to the chest by the shoulders. They consist of the arm, the forearm, and the hand.

The shoulder is formed by two bones—the collar-bone (clavicle) in front, and the blade-bone (scapula) behind.

Clavicles. The clavicles are joined to the sternum by their inner ends, and run almost horizontally outwards to meet the scapula of the corresponding side.

From its shape and position the clavicle is especially liable to be broken, either as a result of violence applied directly to the bone, or, more commonly, indirectly to the shoulder.

Scapulæ. The scapulæ are triangular flat bones. They have a shallow cup-shaped depression, into which is received the rounded upper end of the humerus. This constitutes the shoulder-joint.

Humerus. The humerus is the bone of the upper arm. By its lower end it assists in the formation of the elbow-joint. The other bones which make up the elbow-joint are the two bones of the forearm—the outer being called the radius, and the inner the ulna. The latter bone is the larger and longer. When these bones are parallel to each

Radius and ulna.

other, and the palm of the hand looks upwards, the arm is said to be in the supine position. When the radius crosses in front of the ulna, and the palm is directed downwards, the position is known as prone. The movements of supination and pronation are of importance in relation to these bones. **Supination and pronation.**

The hand is divided into the carpus, or bones of the wrist; the metacarpus, or bones of the palm; and the phalanges, or bones of the fingers and thumb. **Hand: its divisions.** The carpus **Carpus.** consists of eight small bones in two rows. These, named from the outer to the inner side, are as follows: proximal row (that nearest the trunk), scaphoid, semilunar, cuneiform, and pisiform; distal row (that farthest from the trunk), trapezium, trapezoid, os magnum, and unciform. The wrist-joint **Wrist-joint.** is formed by the lower end of the radius and the first row of carpal bones. It must be understood that the ulna does not assist in the formation of this joint, but is separated from it by a triangular layer of cartilage. The palm of the hand contains five long thin bones, which join **Metacarpus.** with the second row of carpal bones at one end, and with those of the fingers at the other. The finger-bones **Phalanges.** (phalanges) are like those of the metacarpus, only smaller; each finger has three, while the thumb has only two.

The bones of the upper limb may be tabulated thus:—

Table of bones of upper limb.

Clavicle Scapula Humerus Radius Ulna 8 Carpal bones 5 Metacarpal bones 14 Phalanges	32 bones for each limb.

There are many points of analogy between the upper and lower limbs.

Here again there are three segments: the thigh, the leg, and the foot—corresponding to the arm, the forearm, and the hand. The lower limb is connected to the trunk by the haunch-bone. **Haunch-bone.** This is a large irregularly shaped bone (hence its other name, innominate or nameless bone), which, with its fellow of the opposite side, forms the front and side walls of the pelvic cavity.

Pelvic cavity. The pelvic cavity, or pelvis (Lat. *pelvis*, a basin), is a strong bony ring placed between the lower end of the spine and the lower limbs, the latter of which it rests upon. It is completed by the sacrum and coccyx behind.

This cavity is of great importance in connection with child-birth; for it is through this canal that the fœtus passes in labour. The male and female pelves differ in several details, the latter being specially modified for the above-mentioned requirement.

Division of the haunch-bone into three parts. In the young the haunch-bone consists of three parts, which unite later in life. These are: (1) the ilium, the broad and expanded part forming the prominence of the hip; (2) the ischium, the lower part of the bone, on which the trunk rests in sitting; and (3) the pubes, which, with the corresponding part of the opposite side, meets in the middle line in front to form the front of the pelvis.

Formation of the acetabulum. All these take part in the formation of a large cup-shaped cavity, the acetabulum, in which the head of the femur is lodged. This constitutes the hip-joint.

Femur, or thigh-bone. The femur, or thigh-bone, is the longest bone in the body, and is the best example of what we understand by a "long" bone—that is to say, a bone with a shaft and two ends. The rounded head is inserted into the acetabulum.

At the outer side of its upper part is a large projection, the great trochanter, which may easily be felt through the skin. The lower end of the bone possesses two eminences (condyles), inner and outer respectively, which correspond to two similar projections on the lower end of the humerus.

Knee-joint. The lower end and the upper end of the tibia, together with the patella, or knee-cap, are the bones concerned in the formation of the knee-joint.

Patella. The patella lies, so to speak, on the top of the knee. It is a flat, rather triangular bone, and may be regarded as lying in and being developed in a tendon which is formed by the large muscles on the front of the thigh, and which is attached to the front of the upper end of the tibia.

Bones of the leg: fibula and tibia. In the leg there are two bones, as there are in the fore-arm: an outer thinner and smaller bone, the fibula; and an inner thicker and larger bone, the tibia, or shin-bone, the sharp anterior edge of which can easily be felt under the skin.

Ankle-joint. The bones of the leg, with one of the bones of the foot (astragalus), make up the ankle-joint.

The foot is divided into the tarsus, the metatarsus, and the phalanges, which correspond to the divisions of the hand. **Divisions of the foot.**

In the tarsus, however, we find only seven bones, of which the largest and strongest is the os calcis (bone of the heel). Neither have we two distinct rows of bones as in the carpus. The os calcis, astragalus, and scaphoid do not form a row. The remaining four, however, form a distal row, corresponding to the distal row of the carpus. These are, from the outer to the inner side of the foot, the cuboid, the external, middle, and internal cuneiform bones. **Tarsus.**

In front of this row lie the five metatarsal bones; these, in their turn, are joined to the phalanges, which correspond in all respects to those of the hand, as already said. **Metatarsus. Phalanges.**

The bones of the lower limb may be tabulated thus:— **Table of bones of lower limb.**

Haunch-bone { Ilium, Ischium, Pubes } Femur Patella Tibia Fibula 7 Tarsal bones 5 Metatarsal bones 14 Phalanges	31 bones for each limb.

The bones of the skeleton are connected together by joints or articulations. Of these there are many varieties in the body, depending on the requirements of each—whether, for example, a movable or immovable joint is required, and, in the former case, the degree of movement necessary. **Joints. Varieties.**

Most of the joints between the bones of the skull are immovable, the articulating surfaces being dovetailed one into another by little tooth-like processes. This form of joint is called a suture. **Immovable joints.**

A good example of joints admitting of limited movement are those between the anterior segments (bodies) of the vertebræ, which, it will be remembered, are separated by discs of cartilage. Another example is the joint between the pubic portions of the two haunch-bones which meet in the middle line to form the symphysis pubis. **Joints with limited movement.**

Joints with free movement. Of joints admitting of free movement there are many varieties, the three principal of which are the ball-and-socket, the hinge, and the gliding.

In the following scheme the principal joints of the body are classified:—

Classification of joints.

I. Immovable joints (Synarthrosis).
 Example: most of the joints between the bones of the skull.

II. Joints with limited movement (Amphiarthrosis).
 Examples: 1. Joints between bodies of vertebræ.
 2. Symphysis pubis.

III. Joints with free movement (Diarthrosis). Varieties:
 a. Ball-and-socket joints.
  Examples: hip and shoulder.
 b. Hinge joints.
  Examples: elbow, knee (partially), and ankle.
 c. Gliding joints.
  Examples: sterno-clavicular, and the joints between the bones of the carpus and tarsus.

Parts of a movable joint. There are certain structures which enter into the constitution of a movable joint such as the knee; and as each of these structures is liable to disease, the importance of knowing about these parts of a joint can be easily understood.

Bone-ends. We have already spoken of the ends of the bones, which are the principal parts of the joint. These ends are called the "articular" surfaces, and are covered with a layer of cartilage (articular cartilage). **Articular cartilage.**

Ligaments. The ligaments are strong, flexible bands of various sizes and shapes, which bind together the ends of the bones.

Synovial membrane. Lastly, there is a thin membrane (synovial membrane) which lines the joint and covers the inner surfaces of the ligaments. **Synovia.** It pours out a secretion (synovia) of a thick viscid consistence, like white of egg, which lubricates the joint-cavity, and allows of free movement of the articular surfaces.

Bursæ. In connection with the joints must be mentioned a series of small closed cavities called bursæ, which contain fluid; they are found in various parts of the body, placed between surfaces which move upon each other and produce friction.

In the affection popularly known as "housemaid's knee" the bursa which lies over the knee-cap becomes inflamed

and enlarged, from an increase in the quantity of fluid contained in it taking place.

Muscular system.

An account of the skeleton and its articulations would be incomplete without a reference to the muscular system. The muscles form the flesh of the body. They are connected chiefly with the bones, but also with cartilage and skin. They vary considerably in size, shape, and in the arrangement of the fibres of which they are composed.

Contraction of muscle: its relaxation.

Most of the mechanical work of the body is performed by the muscles. When a muscle is put into action it contracts; this consists in a forcible shortening of its fibres, accompanied by an increase in thickness of the muscle. It relaxes again by virtue of its elasticity. Muscles are well supplied both with blood-vessels and nerves, by the latter of which they are called into action.

Varieties of muscular fibres: striped and non-striped.

There are two kinds of muscular fibres—the striped and the non-striped.

All the muscles which are under the influence of the will are composed of striped fibres; these are the voluntary muscles. The non-striped fibres occur in the walls of the blood-vessels, and in the walls of the bowel and other hollow organs; these fibres are not under our control, and are therefore termed involuntary muscle-fibres.

Constituent parts of a muscle.

Such a muscle as the biceps of the arm would, on examination, be found to consist of a large number of striped fibres, enclosed in a membrane or sheath, with numerous blood-vessels and nerves.

Points of origin and insertion of a muscle.

The more fixed or central attachment of such a muscle is called its point of origin, while the point to which its force is directed is called its insertion; but, as a rule, the muscle can be made to act from either end.

Tendons.

Muscles end for the most part in cords of variable length and thickness, called tendons, by which they are inserted into the bones.

CHAPTER II.

THE DIGESTIVE APPARATUS.

It is advisable to commence our description of the various parts of the body with those organs which are concerned in the preparation and elaboration of the food.

Alimentary canal. The digestive apparatus, or, as it is commonly called, the alimentary system, consists of a tube or canal about thirty feet long, which extends from the mouth to the anus, or lower orifice of the bowel; it also includes certain accessory organs—namely, the teeth, the salivary glands, the liver, the pancreas, and the spleen. **Accessory organs.**

The various parts of the apparatus will be now described, while the subject of digestion will be considered in a later chapter.

Mouth. The mouth is the first portion of the alimentary canal. Here the food is masticated by the teeth and mixed with the saliva. **Hard and soft palates.** The roof of the mouth is formed by the hard palate in front and the soft palate behind. The former has already been referred to (see p. 4). It is covered by the mucous lining of the mouth. From its hinder end the soft palate is suspended as a movable fold. Its lower border is free, and from its centre there hangs down a little process, the uvula, **Uvula.** which can be easily seen on looking into the mouth. **Folds of the soft palate.** The folds of the soft palate form two arches, one on each side, which pass outwards and downwards from the upper or broad end of the uvula.

Tonsils. In the space between these arches, known as the isthmus of the fauces, lie two almond-shaped bodies, the tonsils, right and left respectively. In health they are hidden by these folds; but they are very liable to become inflamed and enlarged, often so much so as to meet in the middle line and obstruct the breathing.

Teeth. The teeth are divided into two sets: (1) temporary or

milk-teeth, and (2) permanent teeth. They are embedded in sockets in the jaws by their fangs or roots. The part which projects above the gum is the crown.

Varieties of teeth. There are four varieties of teeth: (1) the incisors, or cutting-teeth, in the front; behind these (2) the canines, which are larger and stronger, and correspond to the tusks of carnivorous (flesh-eating) animals; behind these again (3) the bicuspids, or false molars; and lastly (4) the molars, or grinding teeth.

Temporary teeth: their number. The temporary teeth number twenty, and are made up as follows: four incisors, two canines, and four molars in each jaw. It will be seen that there are no bicuspids in this set.

Permanent teeth: their number. The permanent teeth number thirty-two—namely, four incisors, two canines, four bicuspids, and six molars in each jaw.

The number of teeth may be tabulated thus, taking the half of one jaw in each case: temporary set—I2, C1, M2=5; permanent set—I2, C1, Bi2, M3=8. To obtain the total number of teeth multiply the number contained in the half of one jaw by four.

The temporary teeth commence to appear usually about the seventh month; but this period is variable, and may be considerably delayed. The front teeth (incisors) are cut first. The set is usually complete by the end of the second year. These teeth begin to be replaced by the permanent set from the sixth to the seventh year; the last molars (wisdom-teeth) are not fully developed until after the seventeenth year.

Salivary glands. The salivary glands are three in number on each side, the most important one being the parotid, so called from its being placed near the ear. All of these glands pour their secretion, the saliva, into the mouth by little ducts.

Functions of saliva. The saliva has not only a special action on the food, which will be described when the subject of digestion is considered, but, by moistening the mouth, it assists the sense of taste, the mastication and the swallowing of the food, and also articulation.

Pharynx The pharynx is a conical bag, with its broad end uppermost, placed behind the mouth, the nose, and the voice-box, or larynx. It connects the mouth with the gullet. It communicates, in addition, with the nose by the two

posterior openings of the nasal cavities, with the larynx, and with the ears by two tubes (Eustachian tubes). The presence of this last communication can be shown in the following manner:—Close the nostrils and the mouth, and expire forcibly, when a peculiar crackling sound is produced in the ears; this is due to the air which enters the ear through these tubes rendering tense the drum of the ear (membrana tympani). This is made use of in certain diseases of that part of the ear into which the tube opens.

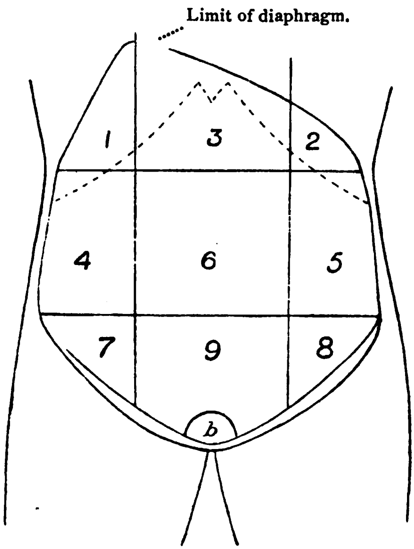


FIG. 2.
THE ABDOMEN DIVIDED INTO REGIONS.

1, 2. Right and left hypochondriac regions.
3. Epigastric region.
4, 5. Right and left lumbar regions.
6. Umbilical region.
7, 8. Right and left iliac regions.
9. Hypogastric region.
b. Bladder distended.

Dotted line represents lower margin of the ribs.

Œsophagus.

The gullet (œsophagus) is a muscular tube about nine inches long, which commences at the lower end of the pharynx, and enters the stomach at its greater end, the opening being known as the cardiac orifice. It passes down the neck behind the wind-pipe (trachea), through the cavity of the chest, and enters the abdomen through an opening in the diaphragm.

Diaphragm.

The diaphragm is a thin curtain or partition, chiefly muscular in structure, which separates the thorax from the abdomen, forming the floor of the former and the roof of the latter cavity. It is convex on its thoracic and concave on its abdominal side. It is the chief muscle of

inspiration; with each breath that we draw it is pushed downwards, and with it the abdominal contents, to rise again at the end of inspiration.

The abdomen. Before mentioning the remaining part of the alimentary system it will be necessary to refer briefly to the abdomen as a whole. It is the largest cavity in the body. We are accustomed to divide it into two parts: (1) the abdomen proper, and (2) the pelvis. It is only with the abdomen proper that we are at present concerned. **Abdomen proper and the pelvis.** For convenience of description the cavity is divided into nine regions by imaginary lines, two transverse and two vertical, drawn from certain fixed points. **Division of the abdominal cavity into nine regions.** These lines and the names of the regions which they enclose will be seen in the diagram (fig. 2).

Peritoneum. The abdomen is lined by a thin membrane, called the peritoneum, which covers both the walls internally, and partially all the viscera contained in it, over which it is folded in a complex manner.

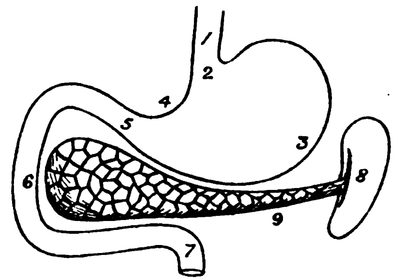


FIG. 3.—DIAGRAM REPRESENTING STOMACH AND DUODENUM.

1. Œsophagus.
2. Cardiac orifice of stomach.
3. Greater curvature of stomach.
4. Lesser curvature of stomach.
5. Pyloric orifice of stomach.
6. Duodenum: the figure is placed opposite the opening of the bile and pancreatic ducts.
7. Jejunum (commencement of).
8. Spleen.
9. Pancreas, lying in the fold of the duodenum.

Stomach. The stomach lies chiefly in the epigastric and left hypochondriac regions. It is curved on itself, its greater expanded end (fundus) lying to the left side behind the lower ribs. By its lesser end it communicates with the first part of the small intestine (duodenum) through an opening called the pylorus. Its inner surface (mucous membrane) contains glands which secrete the gastric juice. **Small intestine: its division into three parts.** The small intestine is a tube about twenty feet long. It is divided into three parts—the duodenum (shown in fig. 3), the jejunum, and the ileum.

Duodenum. The duodenum, so called from its being equal in length

to the breadth of twelve fingers (about nine inches), is in the form of a horse-shoe; its concavity is occupied by the larger end ("head") of the pancreas, an important organ in relation to digestion. This part of the small bowel receives the secretion of the pancreas, and also the bile, which is conveyed to it from the liver by the bile-duct.

Jejunum. Rather less than half of the remainder of the small intestine represents the jejunum; rather more than half, the ileum.

Ileum. The last named opens into the large intestine in the right iliac region.

Large intestine. The large intestine is about five feet long; it commences in the above-mentioned region as a blind pouch, or cul-de-sac, the cæcum (Lat. *cæcus*, blind), attached to which is a little narrow tube (the vermiform or worm-like appendix), that has of late years come to assume an important position n medicine and surgery, from its liability to inflammation and other affections. **Cæcum and vermiform appendix.**

Colon. The large intestine is continued as the colon; passing upwards on the right side of the abdomen (ascending colon) to its upper part, it makes a sharp bend, and courses across the cavity (transverse colon), to descend on the left side (descending colon), and end in the pelvis as the rectum, which opens on the surface of the body posteriorly (anus). The large bowel thus describes an arch, which surrounds the coils of the small bowel. **Rectum.**

It remains to mention two accessory organs—the liver and the spleen.

Liver. The liver is the largest secreting organ (gland) in the body. It lies in the right hypochondriac and epigastric regions, its upper convex surface being adapted to the concavity of the diaphragm. Its chief function is to manufacture the bile, which is stored in a little reservoir (gall-bladder) lying under its right side. It also modifies certain constituents of the blood which passes through its substance.

When, from any cause, the bile, instead of entering the bowel, becomes absorbed into the blood, the skin becomes of a yellowish colour, and the condition known as jaundice results. The bile sometimes becomes solidified in the gall-bladder, producing little stones (gall-stones), which may set up serious symptoms.

Spleen. It is convenient to include the spleen in our account of

the digestive apparatus, although it belongs more strictly to the chapter dealing with the blood, since it is concerned in its formation, perhaps also to a certain extent in its destruction. It is what is known as a ductless gland—that is to say, it does not pour out any definite secretion, as do, for example, the liver and pancreas. It has been found that the spleen, important organ as it is, is not essential to life, as it has within recent years been successfully removed for disease. The organ is very liable to changes in size, and in some diseases (ague, for example) it may attain huge proportions.

The following table gives the various parts of the alimentary system in tabular form:—

Table of the alimentary system.

A. The Alimentary Canal.

- Mouth.
- Pharynx.
- Œsophagus.
- Stomach.
- Small intestine (small in diameter).
  - Duodenum.
  - Jejunum.
  - Ileum.
- Large intestine (large in diameter).
  - Cæcum and vermiform appendix.
  - Colon.
    - Ascending.
    - Transverse.
    - Descending.
  - Rectum.

B. Accessory Organs.

- Teeth.
- Salivary glands.
- Liver.
- Pancreas.
- Spleen.

CHAPTER III.

THE BLOOD AND THE PARTS CONCERNED IN ITS CIRCULATION.—THE PULSE.

THE blood is the fluid from which all the tissues of the body derive their nourishment.

Our health depends very largely on its degree of purity; for when it is deficient, either in quantity or in quality, the whole body suffers.

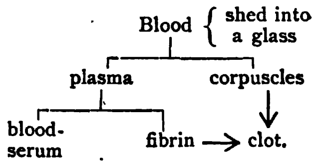
The mere presence of the blood is not, however, sufficient to maintain life. Its perpetual motion is also necessary.

This phenomenon—the circulation of the blood—was discovered by Harvey in the seventeenth century, and may be truly said to constitute the basis of physiology.

Elements of the blood. The blood consists of two elements: (1) a fluid part, called the plasma; and (2) a solid part, which is made up of little bodies known as corpuscles, which are suspended in the serum.

So long as the blood remains in the body it is perfectly fluid; but, on being shed, certain changes take place, which result in the formation of a clot—in short, the blood coagulates. Were it not for this, a cut or wound might result in loss of life, from inability to stop the bleeding. We shall see in another chapter that there is a condition occasionally met with in which the blood has not the power of coagulating. **Coagulation of the blood.** These changes, which are best seen when some blood has been shed into a glass, are, briefly, as follows:—The blood gradually becomes more solid, until it is transformed into a jelly. Soon a few drops of fluid appear on the surface of this jelly, and this increases until the jelly, which has now shrunken in size and become more solid, comes to float in the fluid. What has happened is this: the plasma has become split up into two new

substances—namely, blood-serum and fibrin. The former is the fluid which is derived from the jelly; the latter is contained in the clot, which, examined under the miscroscope, would be seen to consist of a dense network (fibrin), which has entangled the corpuscles. The changes may be represented as follows :—



There are two kinds of corpuscles, red and white; the former are very much more numerous, being in the proportion of about five hundred to one, although this is variable, even in health. **Red and white corpuscles.**

The amount of blood covering a cubic area of about $\frac{1}{25}$th of an inch would contain from four to five millions of red and about ten thousand white corpuscles.

The red corpuscles give to the blood its characteristic colour. They are very small, about $\frac{1}{3000}$th of an inch in diameter. The white corpuscles (leucocytes) are usually somewhat larger in size, but they vary considerably both in size and in shape.

The corpuscles are constantly being destroyed and renewed. In diseased states their number and shape may be greatly modified, as we shall see hereafter.

The quantity of blood in the body is usually stated to correspond to a thirteenth part of the weight of the individual, so that a man weighing ten stone would have almost eleven pounds of blood in his body. **Quantity of blood in the body.**

We have said that the blood constitutes the source of nourishment for the tissues. Not only this, but it also removes their waste material.

It acts as the medium between the atmosphere and the tissues, by virtue of its power of absorbing oxygen from the former and taking up carbonic acid from the latter.

The oxygen is contained in the colouring matter (hæmoglobin) of the red corpuscles, and is readily given up by them as required. The carbonic acid, on the other hand, is contained chiefly in the plasma.

We pass on now to the apparatus which is concerned with the circulation of the blood. This consists of the heart and blood-vessels, the latter including the arteries, veins, and capillaries.

The heart. The heart is a hollow organ, which may be likened to a pump, whose force lies in the muscle which composes its walls. Its action may be regarded from two standpoints—namely, the mechanical and the vital. It acts mechanically as a pump by throwing into the arteries at each beat a certain quantity of blood. This action is regulated by certain valves, which prevent a backward flow of the blood.

Twofold action of the heart.

The vital action of the heart is concerned in the regulation of its beats, and in the adaptation of the organ to the various changes to which it is subjected, both internal and external.

If the heart were nothing more than a machine, the same amount of blood would be delivered to each organ and tissue under every condition with an unvarying monotony, but in virtue of its vital action the quantity of blood required for any particular part of the body at any particular time can be accurately adjusted. The vital action of the heart is very largely controlled by a special part of the brain situated in the medulla oblongata (see chapter vi.).

Position and shape of the heart. The heart is placed between the lungs, and is enclosed in a bag, called the pericardium. Somewhat conical in shape, with the broad end above and to the right, and the narrow end (apex) below and to the left, it lies obliquely in the chest, chiefly on the left side. The heart is fixed by its upper end (base), to which are attached the great blood-vessels, which carry the blood to and from its cavities (see fig. 4, p. 22). Its apex lies free, and impinges against the chest-wall each time the heart beats; this constitutes the "apex-beat," and may usually be seen on looking at the chest at a spot somewhat internal to and below the left nipple. The apex-beat may be altered in its character and position under various conditions, and is an important sign in the examination of the heart.

The heart is divided into two sides, right and left, which do not communicate after birth. The former contains impure or venous blood, the latter pure or arterial. Each side consists of two cavities—an upper smaller one, the auricle, and a lower larger one, the ventricle. The opening

between these cavities is guarded by a valve, one on each side. That on the right side is called the right auriculo-ventricular or tricuspid (three segments) valve; and that on the left, the left auriculo-ventricular or bicuspid (two segments). The latter is more generally known as the mitral valve, so called from its supposed resemblance to a bishop's mitre.

A thin membrane, the endocardium, lines the cavities of the heart, and assists in the formation of the valves.

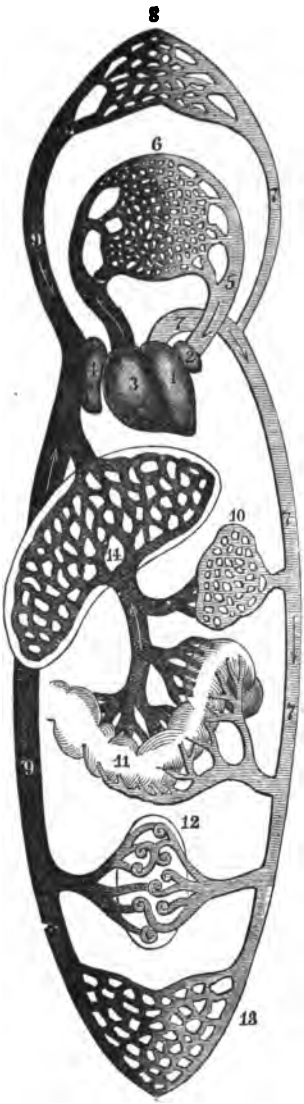
Let us now trace the course of the blood.

Circulation of the blood. The venous blood is brought to the right auricle by two large veins, that from the head and upper limbs by the superior vena cava, and that from the abdomen and lower limbs by the inferior vena cava. The blood now flows through the auriculo-ventricular orifice into the right ventricle. The ventricle then contracts, and the blood is driven into a large vessel, the pulmonary artery, which conveys it to the lungs. Reflux is prevented from taking place into the auricle by the tricuspid valve closing after the auricle has discharged its contents. A valve situated at the mouth of the pulmonary artery acts in a similar manner by closing the pulmonary opening as soon as the ventricle has emptied itself.

The blood is purified in the lungs and returned by the pulmonary veins to the left auricle. Thence it flows into the left ventricle, and with each contraction of the heart is driven into a large artery, the aorta, which distributes it all over the body. There are valves on the left side of the heart corresponding in position to those on the right side, which act in a similar manner. In health the two sides of the heart act together, so that with each beat blood is thrown into the pulmonary artery and aorta respectively.

A study of fig. 4, showing the circulation diagrammatically, will help the nurse to understand the course taken by the blood. The dark shading represents venous blood, the light shading arterial. It will be seen that there is a lesser or pulmonary circulation, and a greater or, as it is usually called, systemic circulation. To follow the course of the blood from the aorta necessitates a description of the blood-vessels of the body.

Definition of artery and vein. It must be understood that an artery is not necessarily a vessel which carries bright (arterial) blood, nor does a vein



always carry dark (venous) blood. We have already seen that the pulmonary artery carries venous blood to the lungs, and that the pulmonary veins return arterial blood to the heart. An artery, then, is a vessel which carries blood from the heart, and a vein a vessel which carries blood to the heart, irrespective of the kind of blood they contain.

Arch of the aorta.

The aorta, on springing from the left ventricle, arches over to the left side; this part is known as the arch of the aorta.

Arteries of the body.

It then passes down the back of the chest (thoracic aorta), and, piercing the diaphragm, enters the abdomen (abdominal aorta), where it ends at a point nearly opposite the navel by dividing into the right and left common iliac arteries, so called from their relation to the iliac bones. From these vessels are derived the arteries of the pelvis and the lower limbs. The large artery of the thigh is the femoral. Commencing in the fold of the groin about its middle, it passes down the thigh towards its inner side.

FIG. 4.—DIAGRAM OF THE CIRCULATION (DALTON).

1. Left ventricle.
2. Left auricle.
3. Right ventricle.
4. Right auricle.
5. Pulmonary veins.
6. The lungs.
7. Aorta.
8. Brain and upper extremities.
9. Venæ cavæ.
10. Spleen.
11. Intestine.
12. Kidney.
13. Lower extremities.
14. Liver.

Just above the knee it receives a new name (popliteal), and lies at the back of the knee-joint. The popliteal artery is of importance to the surgeon, owing to its liability to become affected by aneurism—a condition in which an artery tends to give way in one or more of its coats, causing a swelling which is liable to burst. This vessel enters the leg, and divides into two arteries, which supply the leg and foot.

To return to the arch of the aorta, we find that the large arteries for the head and upper limbs are given off from this part.

The carotid arteries pass up the neck, one on each side, and, dividing into internal and external branches, are distributed to the inside and outside of the head respectively. The subclavian arteries supply the upper limbs. When these vessels pass out of the chest, they are called the axillary arteries, after the axilla, or arm-pit, in which they lie. In the upper part of the arm (brachium) the vessel changes its name once more (brachial artery). Below the elbow the brachial artery divides into the radial and ulnar arteries, which lie in connection with the respective bones after which they are named. These supply the forearm and hand with blood. It is the radial artery which we make use of to feel the pulse, because of its convenient position.

To complete our account of the arterial system, we must mention that the abdominal organs are supplied by branches from the abdominal aorta. These branches go to the stomach, liver, bowels, spleen, kidneys, and other parts.

The arteries of the body divide and subdivide into **Capillaries.** numerous branches as does a tree, until they eventually end in a vast number of little tubes, called capillaries. These allow of the water and other constituents of the blood passing to and from the tissues outside them. It is thus that the interchange of material takes place between the blood and the tissues. The capillaries gradually unite **Veins.** to form the veins, which in their turn again unite to form the two large veins we have seen to return the venous blood to the right side of the heart—namely, the superior and inferior venæ cavæ.

The blood which goes to supply the stomach, spleen, **Portal vein.** and bowels is not, however, returned directly into the inferior vena cava, but is first collected into a large vein,

the portal vein, by which it is conveyed to the liver. It will be seen, then, that the blood which supplies the alimentary canal and spleen passes through two sets of capillaries, one set in the walls of the canal and in the spleen, and a second set in the liver. What is known as the "portal circulation" is therefore a supplementary apparatus, which allows of the blood that has absorbed nutritive material from the stomach and intestines to be passed through the liver, where it undergoes further changes, before being returned to the heart. This is shown in the diagram of the circulation of the blood (fig. 4).

Fœtal circulation. We must now point out, briefly, how the circulation before birth differs from that after birth (fig. 5). To assist in an understanding of the fœtal circulation, it must be borne in mind that (1) the fœtus is nourished by the mother's blood by means of an organ called the placenta; (2) this organ not only extracts nourishment from the maternal blood, but also aerates the blood; (3) the action of the lungs is now in abeyance, and only sufficient blood goes to these organs to nourish them; (4) there is a direct communication between the right and left auricle, the foramen ovale (oval hole), which closes after birth; and (5) there is also a direct communication between the pulmonary artery and the aorta. The following scheme will render the description more intelligible. It should be contrasted with that showing the circulation after birth. The blood leaves the placenta by the umbilical vein, which, with the arteries of the same name, is contained in the umbilical cord. The cord enters the abdomen at the umbilicus. The umbilical vein empties itself into the inferior vena cava, which opens into the right auricle. Instead, however, of passing on into the right ventricle, this stream passes through the foramen ovale into the left auricle, and thence into the left ventricle. Leaving the ventricle in the usual way by the aorta, it is distributed to the body generally, but more especially to the head and upper limbs. The venous blood from the latter parts is returned by the superior vena cava into the right auricle, and this stream passes on into the right ventricle, and thence into the pulmonary artery. We see, then, that in the right auricle there are two streams of blood, one stream passing from the inferior vena cava through the foramen ovale, the other

from the superior vena cava into the right ventricle. The blood in the pulmonary artery goes in part to the lungs, from which it is returned into the left auricle by the pulmonary veins, and in part directly into the arch of the aorta through a channel, the ductus arteriosus, which, after birth, becomes shrivelled up. This blood becomes mixed with that which we saw to enter the arch from the left ventricle, and goes to the abdomen and lower limbs, the chief part, however, passing along the umbilical arteries back to the placenta, the point from which we started.

SCHEME TO REPRESENT

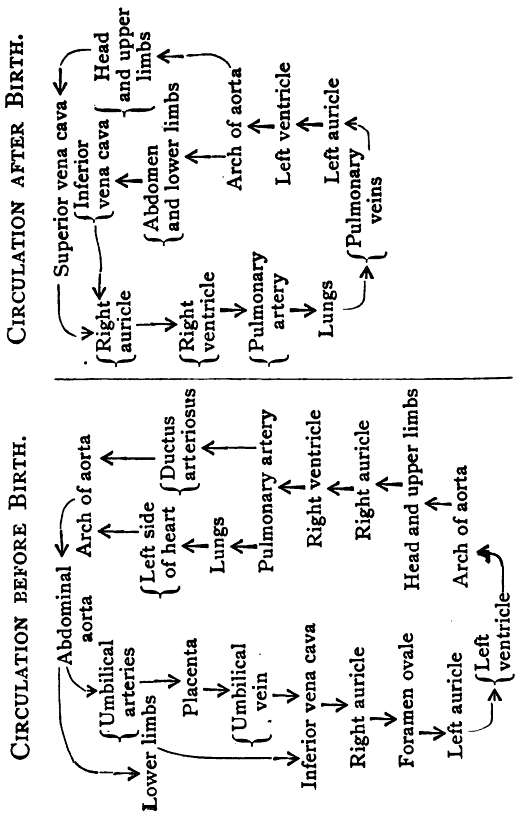


FIG. 5.

Structure of arteries and veins.

The arteries and veins may be regarded as elastic tubes, the calibre of which is graduated according to the amount of blood flowing through them by impulses transmitted to the nerves in their walls from the nervous system. They possess three coats—an outer composed of bands of connective tissue, a middle muscular coat, and an inner lining similar in structure to the endocardium.

The veins have thinner walls than arteries of the same size. In some parts of the body they have valves, placed at intervals in their interior, which act by supporting the column of blood and preventing its backward flow. Veins are liable to become enlarged and tortuous, when they are spoken of as varicose.

As age advances the arteries lose their elasticity, and become more or less rigid from changes taking place in their coats. It is this change which has given rise to the expression, "A man is as old as his arteries"; for a man of forty may have arteries which are more similar to those we should expect to find in a man twenty years older.

The lymphatic system.

Our account of the blood and its circulation must include the lymphatic system. This consists of the lymphatic vessels and glands, and also of the lacteals, or the lymphatic vessels of the small intestine, which contain the chyle during digestion.

The lymphatic vessels commence in small tubes, the lymph-capillaries, which correspond to the blood-capillaries which they accompany, and with which they are closely associated. Uniting together, they form trunks, which accompany the veins. At intervals in their course they enter the lymphatic glands, in which they form a network. These glands are found, among other places, in the neck, axilla, groin, thorax, and abdomen.

Thoracic duct.

The lymph is eventually poured into the blood by two ducts, one on either side, opening into the junction of two large veins at the root of the neck. The duct on the left side is the larger and more important of the two, and has received a special name, the thoracic duct.

The lacteals empty themselves into the lower dilated end of the thoracic duct, which is termed the receptacle of the chyle (receptaculum chyli). Any poison which may be introduced into the blood is absorbed by the lymphatics, which causes an enlargement of the glands with which they

communicate. As an example of this we may mention the enlargement and inflammation which are apt to affect the axillary glands and those of the groin, following upon a wound of the hand or foot respectively, into which anything of a poisonous nature has gained admission.

Sounds of the heart. On listening to the healthy heart with the stethoscope at the spot where the apex inpinges against the chest-wall, the doctor hears two sounds, the first longer than the second. They may be imitated by pronouncing the syllables "lubb, dup," somewhat accentuating the first one. The first sound occurs with the contraction of the heart, or, as it is sometimes called, the systole; the second occurs while the heart is at rest (diastole), just after the blood has been driven into the pulmonary artery and aorta. When we come to speak of valvular and other diseases of the heart, we shall find that these sounds may be modified in their character, or even replaced by another sound (murmur).

The pulse. With each beat of the heart a wave is sent into the arteries, which is transmitted onwards to their terminations, by virtue of their elasticity. This constitutes the pulse. The closer the artery is to the surface the more readily can it be felt. As has been said, the radial artery at the wrist is used to feel the pulse; but sometimes other arteries are used—for example, the temporal artery (in the region of the temple), when the observation is made during sleep, and we wish to avoid disturbing the patient. The pulse appears at the wrist about a tenth of a second after the beat of the heart. The smaller the artery the less is the pulsation; so that when the heart is acting feebly the pulse may be imperceptible at the wrist, when a larger artery, such as the femoral, must be selected. **The observation of the pulse.** So important is the pulse as a guide to disease that the nurse must accustom herself to its accurate observation. She will only be called upon to report as to its frequency; but the doctor takes other points into consideration, such as strength, regularity, and volume.

The pulse should always be counted for a minute; sometimes it may be counted for four consecutive periods of fifteen seconds. The observation should always be made with the least possible disturbance of the patient, and the wrist should always be at rest, and not held up, unless

supported by the other hand. Lay two fingers on the artery, and make slight pressure on it.

Rate of pulse. The rate of the pulse varies according to age, sex, temperature, rest, exercise, food, and many other conditions.

The average rate in health may be regarded as seventy-two beats per minute. In children it is much more rapid—from a hundred to a hundred and twenty in the very young.

Some people in perfect health have a very rapid pulse; while others, equally healthy, have an unusually slow pulse. It is obvious, therefore, that the rate of the pulse, by itself, does not count for very much.

In a rapid pulse there is a relatively shorter pause between the beats than in a slow pulse.

Irregularity of pulse. A pulse whose beats vary in duration and in force is said to be irregular.

Compressibility of pulse. A pulse is said to be compressible when it can be easily stopped, and incompressible when the reverse holds good. To contrast these let the nurse observe the pulse in a severe case of typhoid fever, for example, and in a case of advanced chronic kidney disease. The artery in the first case can be easily compressed; in the second case it feels like a piece of whipcord.

Large and small pulse. When a large quantity of blood is propelled into the arteries with each beat of the heart, the pulse is said to be large or full; and when only a small amount enters the arteries with each contraction of the heart, it is said to be small.

Other terms used to describe the pulse. Certain other phrases are applied to the pulse, such as bounding, thready, collapsing, wiry, and flickering. Terms such as these explain themselves.

Sphygmograph. The instrument which is used for taking a tracing of the pulse is called a sphygmograph. The tracing obtained is called the sphygmogram, or, more simply, the pulse-tracing. This instrument is of value, as demonstrating to the eye the character of the pulse, and thus testing the effects of treatment in a given case.

CHAPTER IV.

THE ORGANS OF VOICE AND RESPIRATION, AND THE AERATION OF THE BLOOD.

THE part of the body which is concerned in the production of the voice is called the larynx.

This organ may be compared to a short, more or less cylindrical box, which opens above into the pharynx and below into the upper end of the windpipe. It is composed of a framework of cartilages, which are bound together by bands and muscles.

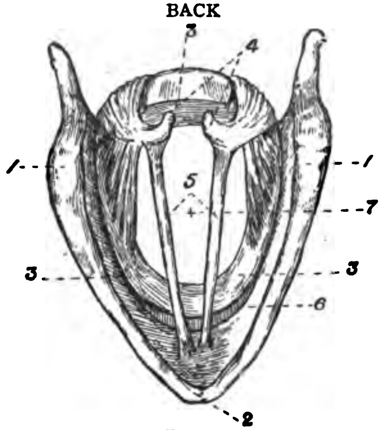
A glance at the diagram (fig. 6) will show their arrangement.

Thyroid cartilage. The thyroid cartilage (like a shield) is the uppermost and largest. It is V-shaped, the point of the V being in front and forming the prominence in the neck which is known as "Adam's apple." **Cricoid cartilage.** Below this cartilage lies the cricoid, so called from its resemblance to a signet-ring, the broad part of the ring lying behind. There is a little space between these two cartilages in front, which is filled in by a membrane (crico-thyroid membrane). It is in this spot that the larynx is opened in the operation known as laryngotomy, which is described in a later chapter (see chapter xix.).

Arytenoid cartilages. At the back of the larynx is a small pair of cartilages (arytenoid cartilages), pyramidal in shape, which are placed on the upper and back part of the cricoid cartilage (on the "signet" part of the ring), one on each side. These cartilages have their inner surfaces flat, so that they can be approximated, as happens during the production of sound. **Vocal cords.** They give attachment to the two vocal cords, which may be described as two delicate parallel bands which stretch across the cavity of the larynx from these cartilages behind to the thyroid cartilage in front. **Glottis.** Between these cords lies a chink, called the glottis, which varies in length from about

an inch in the male to three-quarters of an inch in the female. The arytenoid cartilages revolve round a vertical axis, and when their inner surfaces are in contact the vocal cords become approximated, and the glottis is partially or completely closed. On the other hand, when the cartilages are rotated outwards, so that their inner surfaces are no longer in contact, the vocal cords become separated, and the glottis is opened. This is the condition of the glottis in quiet breathing. The vocal cords produce the voice by their vibrations: the greater the number of these vibrations the higher is the note produced. The quality of the voice depends on the state of the cords: for example, if the cords become thickened and swollen the voice is altered in character, or perhaps even lost. Good singers usually have thin vocal cords.

BACK



FRONT

FIG. 6.

INTERIOR OF LARYNX SEEN FROM ABOVE.

1. Thyroid cartilage.
2. Front of same, forming projection known as Adam's apple.
3. Cricoid cartilage.
4. Arytenoid cartilages.
5. Vocal cords.
6. Space between the thyroid and cricoid cartilages closed in by a membrane.
7. Glottis.

Epiglottis.

We have still to mention one of the cartilages of the larynx—namely, the epiglottis (Gk. *epi*, upon; *glottis*, the glottis), so called because it acts as a lid to the larynx. It is shaped like a leaf, the narrow end of the leaf being attached to the inside of the angle formed by the two sides of the thyroid cartilage and the broad end lying free behind. During respiration it is directed upwards, but in the act of swallowing it is turned backwards, so as to completely close the opening of the larynx—otherwise the food

would be liable to pass down into the larynx, with disastrous results.

We have seen that the vocal cords are the parts essentially concerned in the production of the voice; but for speech we require also the mouth and the lips.

Laryngoscope. To ascertain the condition of the larynx we make use of an instrument, called the laryngoscope. It consists of a small mirror, fixed in a handle at an angle, which is placed at the back of the mouth, the tongue being drawn forwards. The light is thrown into the mouth against this mirror by means of a large reflecting mirror fixed to the observer's forehead.

Trachea. We pass on now to the windpipe (trachea), which is a cylindrical tube from four to five inches long. It is composed of a framework of cartilage in the form of rings, which can be easily felt in the neck. These rings are connected together by membrane. It extends from the lower end of the larynx to the spot where it divides into the two bronchi, right and left. It is closely related to an important structure, called the thyroid gland.

Thyroid gland. The gland consists of two portions, one lying on each side of the trachea, united by a narrower part, the isthmus, which crosses over the front of the windpipe in its upper part. This point we shall find to be an important one in connection with the operation of tracheotomy, in which the trachea is opened to give relief in cases of obstructed breathing. The operation is designated "high" and "low," according as the trachea is opened above or below the isthmus of the thyroid.

Tracheotomy, "high" and "low."

The thyroid gland, which, it is almost needless to say, must be distinguished from the cartilage bearing the same name, has no functional connection with the respiratory organs, and we only mention it in this chapter because of the relation it bears to the trachea. It will suffice to say that enlargement of the gland is known as goître, or popularly as "Derbyshire neck," owing to its prevalence in that part of the country. By the pressure of a large goître on the trachea the breathing may be seriously interfered with, necessitating an operation for its relief. When the gland ceases to perform its functions, or when it is entirely removed, a curious set of symptoms follows, to which the name myxœdema has been given. This disease

will be described in connection with affections of the blood (see chapter xxiii.).

Bronchi. The two bronchi, right and left, into which the trachea divides, enter the right and left lungs respectively, and divide and subdivide into little tubes, called bronchioles, which eventually end in the air-cells (alveoli).

Lungs. The lungs occupy the right and left sides of the chest, being separated by the heart. In shape they are more or less conical, presenting two surfaces, an outer convex and an inner concave—a base, which rests on the midriff (diaphragm), and an apex, which projects into the neck above the level of the first rib on either side.

Each lung is divided by a cleft into two lobes, an upper and a lower. In the case of the right lung, however, a small piece is cut off from the upper to form a middle lobe.

The lungs are spongy in texture, and are made up of a large number of lobules, each of which represents the ending of a bronchiole, with its air-cells and its accompanying blood-vessels and nerves.

Blood-vessels of the lung: their endings in the air-cells. The pulmonary artery, which conveys the venous blood to the lungs, divides and subdivides, until it ends in a fine capillary network, which is spread out over the walls of the air-cells and the passages between them. From this network arise the small veins, which, coalescing, unite to form the pulmonary veins. These return the purified blood to the left side of the heart.

That part of the lung where the bronchus and pulmonary artery enter and the pulmonary veins emerge is known as its root. It is by the root that the lung is attached to the heart, the rest of the organ lying free in the cavity of the chest. The lungs are covered with a membrane, similar in structure to the peritoneum and pericardium, called the pleura. This membrane is folded back (reflected) at the root of the lung, to line the wall of the chest.

Pleura. The pleura on each side may be looked upon as a closed sac, whose surfaces are in apposition, but are capable of being separated, under abnormal conditions, either by air or fluid. It is, in fact, a potential cavity. Below, the pleura covers the upper surface of the diaphragm. Its inner surfaces are smooth, and lubricated by a small

quantity of fluid, which allows them to glide freely over each other with each respiratory movement.

Inflammation of this membrane is called pleurisy. The disease will be described in the chapter dealing with affections of the respiratory organs.

A study of fig. 7 will assist the nurse in understanding the lungs and their connection with the heart. The

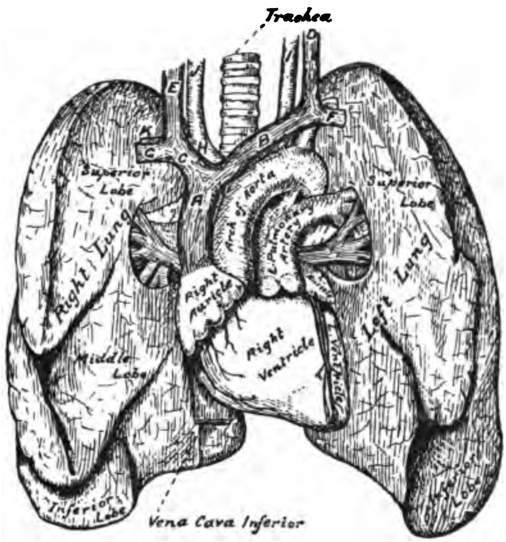


FIG. 7.—THE LUNGS AND HEART IN ONE MASS, AS SEEN FROM THE FRONT.

The lungs are represented as having fallen outwards on each side, thus showing their inner surfaces.

A. Superior vena cava.
B. Left innominate vein.
C. Right ,, ,,
D. Left internal jugular vein.
E. Right ,, ,, ,,
F. Left subclavian vein.
G. Right subclavian vein.
H. Innominate artery.
I. Left common carotid artery.
J. Right ,, ,, ,,
K. Right subclavian artery.

pulmonary vessels and the bronchi behind them are shown entering the lungs on either side.

Respiratory function of the lungs.

We must now enquire how the lungs perform their respiratory functions.

A respiratory act is constituted by an inspiration or

drawing of air into the chest, and an expiration or forcing of air out of the chest. In producing these movements both the ribs and the diaphragm are called into play. Let us first consider inspiration; here two movements take place, firstly a downward movement of the diaphragm, and secondly an upward movement of the ribs. As a result the capacity of the chest is greatly increased. The lungs follow the chest-wall, and in consequence the air-cells become expanded, and air passes into the lung to equalise the diminished pressure which has resulted from its enlargement. At the end of inspiration the muscles relax, and the elasticity of the lung-tissue causes the organ to diminish in size, the chest-wall following it. This constitutes an expiration. There is now a pause before the next inspiration.

Whereas inspiration is a muscular act, expiration is at any rate chiefly non-muscular, being dependent on the elasticity of the lungs, and also of the chest-walls.

The amount of air which passes into and out of the chest during an ordinary respiration is known as the tidal air, obviously so called from the simile of the ebb and flow of the tide.

We are quite aware that in ordinary quiet breathing we do not expand our chest to the full, nor do we completely empty the chest of air. By forced breathing, however, a much larger quantity of air may be taken into and thrown out of the chest; but there is always a certain amount of air left, even after the greatest expiratory effort it is in our power to make. This is the residual air.

It must always be remembered that the chest is an air-tight cavity, and that if from any cause air gains admission into the pleura (pneumothorax) then the air as a rule ceases to enter the lung, which consequently collapses, assuming the condition it presented before birth.

Respiration is more rapid in women than in men, and still more rapid in children. Women breathe more especially with their chest, whereas in men the movements are chiefly confined to the abdomen.

The rate of respiration varies very considerably. It usually bears a distinct ratio to the pulse-rate, one respiration representing four or five beats of the pulse.

An average rate of respiration may be stated to be about

sixteen to the minute. Exertion and excitement increase their frequency, as does also deficient oxygenation of the blood.

Regular recording of the respirations. The nurse must accustom herself to the regular recording of the respirations; and, as they are partly under our control, it is important that the patient be unconscious of their observation. A good plan to adopt is to count them as soon as the pulse has been taken and before the finger is removed from the artery; the patient believes that the pulse is still being counted, and thus a reliable observation is made. The movements of the bed-clothes are often sufficient to enable us to count the respirations, but where there is any doubt the hand should be placed lightly over the stomach.

A respiratory rate below ten or above forty generally points to danger, and should always be reported to the doctor.

The character as well as the frequency of the respirations may be altered. In laboured breathing (dyspnœa) muscles not usually called into play are requisitioned. A good example of this is the movement of the nostrils, which is sometimes very marked, and may often be observed in children suffering from bronchitis and other respiratory troubles.

The air which passes into and out of the chest normally passes through the nose, and not through the mouth. In its passage through the nose it is warmed. Those people who habitually breathe through their mouth are more liable to colds than are those who breathe naturally, because the air enters the lungs in a chilled condition.

Relation of the nervous system to respiration. What is the relation of the nervous system to respiration? We have said that breathing is partly under our own control, but it is by no means entirely so, as any one can prove who attempts to stop breathing. He soon finds that he cannot for any length of time hold his breath. Even when unconscious the breathing continues. It is thus an involuntary act. **The respiratory centre.** Briefly, the respiratory function is controlled by a certain part of the brain, which is called the respiratory centre. It is situated in the medulla, or bulb. It has been shown by experiment that if the whole of an animal's brain above the level of this centre be removed breathing still continues. This enables us to localise the respiratory centre. On the other hand, were this portion of the brain to be injured or removed,

breathing would at once cease and death ensue, although the rest of the brain were preserved intact—unless, of course, artificial respiration were to be kept up unceasingly.

Areation of the blood. We have still to point out how the impure blood is rendered pure in its course through the lungs.

The blood which is contained in the capillary network in the walls of the air-cells is exposed to the action of the air, and, by a process of diffusion, an interchange of gases takes place, the walls of the air-cells being thin enough to allow of the passage through them of gases, but not of liquids.

The oxygen of the air has a more powerful affinity for the blood than it has for the nitrogen with which it is associated in the atmosphere; on the other hand, carbonic acid gas is given up readily to the air, so that the blood takes up oxygen and parts with its carbonic acid.

The oxygen of the blood is contained in the hæmoglobin of the red corpuscles, and may be removed by physical or chemical means, when the blood loses its arterial characters and becomes of a purplish hue.

The carbonic acid gas is, on the other hand, chiefly contained in the serum of the blood. Its presence in expired air may readily be shown by blowing through a tube into a glass containing some lime-water, when a white cloud appears. This is caused by the carbonic acid gas uniting with the lime to form carbonate of lime, which is deposited in the water.

Carbonic acid gas is poisonous to animals, but by a provision of nature the atmosphere is prevented from becoming vitiated by the accumulation of this gas; for in the vegetable world the function of respiration, under the influence of sunlight, is reversed; carbonic acid is taken in and oxygen is given off. Hence the changes in the animal world are balanced by those which take place in the vegetable. This cycle of changes may be represented diagrammatically:—

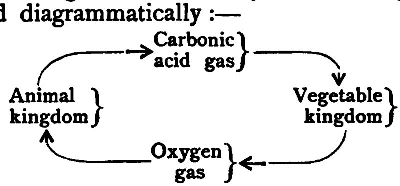


FIG. 8.

CHAPTER V.

THE ORGANS OF EXCRETION.

UNDER this heading we include those organs which are concerned in the discharge of the waste material from the body. These organs are the kidneys, the skin, and the lungs. The last named we have already considered.

The chief waste material of the body may be classified as follows: (1) A substance called urea, which represents a large proportion of the food-stuffs, which have been transformed into it in their passage through the body; (2) carbonic acid, which we have seen to leave the body in the expired air; (3) various salts; and (4) water. **Waste materials of the body.**

The urea is nearly all discharged by the kidneys. The salts are chiefly eliminated by the kidneys, to a slight degree by the skin, and the water leaves the body by all three channels, but chiefly by the kidneys. It will be seen, then, that the kidneys are the most important excretory organs, and it is to these, together with the rest of the urinary apparatus, that we shall first direct attention.

The consideration of the urine will be taken up in a later chapter (see chapter x.).

The urinary apparatus (fig. 9) consists of the two kidneys, right and left, their respective ducts, the ureters, the bladder or reservoir where the urine is stored, and the outlet of the bladder, the urethra, which ends in an aperture, the meatus. These parts we shall briefly refer to in order. **Urinary apparatus.**

The kidneys lie on the posterior wall of the abdomen, in the loin. They lie outside the peritoneum, which we saw lined the cavity of the abdomen. This is of importance to the surgeon, who is able to reach the kidneys from behind without interfering with the peritoneum. Their shape is so well known that we are accustomed to use the term **The kidneys.**

kidney-shaped as a descriptive one. The inner or concave edge of the organs contains a depression called the hilum. Here the ureter leaves the kidney, and the blood-vessels and nerves pass into and out of the organ. The kidneys are covered with a tunic, the capsule, which in the healthy organ can be stripped off, but in disease of the kidney it may be difficult or impossible to remove it.

The essential structure of the kidney, the secreting part, consists of a complicated arrangement of tubules and tufts. The tubules communicate with a cavity, called the pelvis of the kidney, which gives origin to the ureter. This cavity may indeed be regarded as the upper swollen or dilated end of the ureter. Sometimes it becomes enormously distended, at the expense of the kidney substance. Such a condition is liable to occur when the ureter becomes blocked, as may occasionally occur from the impaction of a stone (calculus) in its interior, and the urine is dammed back in the kidney.

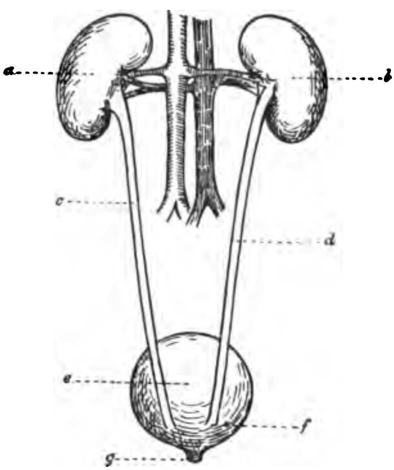


FIG. 9.—URINARY ORGANS FROM BEHIND.

a. Left kidney.
b. Right kidney.
c. Left ureter.
d. Right ureter.
e. Urinary bladder.
f. Opening of ureter into bladder.
g. Opening of urethra.

The urine which is poured out by the tubules is collected in the pelvis of the kidney, to be discharged by the ureter into the bladder.

Ureters. The ureters pass down obliquely to enter the back wall of the bladder, one on each side, by a valvular opening. These openings are only about two inches apart, and are so arranged as to prevent a reflux of the urine. The position of the ureters is of great importance to the surgeon in connection with certain operations, especially on the uterus (womb), as they may be easily damaged.

The bladder varies in shape according to its degree of distension : when moderately full it is rounded, but becomes more ovoid in shape when it is fully distended. In the adult the bladder lies in the pelvis in front of the rectum and behind the pubic bones. In the female the uterus is placed between the bladder in front and the rectum behind. When the bladder becomes very full it rises up out of the pelvis, and may even reach up to the umbilicus in cases of retention of urine, where the urine, for one reason or another, cannot be passed. **Bladder: shape and position.**

Such a condition as this (retention of urine) must be distinguished from suppression of urine, where there is no urine secreted at all. In both cases no urine is passed, but the two conditions are quite distinct the one from the other. The bladder may be said, in the adult, to hold about a pint of urine, but the capacity varies very greatly. The urine passes down into the bladder partly by the action of gravity, and partly by muscular contractions taking place in the walls of the ureter, similar to those which take place in the walls of the intestine (peristalsis). It is evacuated by a complex mechanism, which is usually under our control, but under certain conditions may act involuntarily. **Retention of urine: suppression of urine.**

The urethra is situated at the lower and front part of the bladder, and differs in its anatomical relations in the two sexes. **Urethra.**

We must now consider the third organ for the discharge of waste material from the body—namely, the skin. It must be noted, however, that the skin has other functions than that of excretion. It acts as a protection to the body; it is the great seat of sensation of touch, or, as it is commonly called, the tactile sense. Lastly, by it the temperature of the body is chiefly controlled. When a large quantity of blood circulates in the blood-vessels of the skin, a corresponding quantity of heat is lost to the body, and by this means the skin has the power of regulating very accurately the amount of heat lost. In cold weather our skin is cold, because the blood-vessels contained in it have little blood in their interior. This is nature's way of preventing an excessive loss of heat, which the body cannot spare. By keeping the blood as far as possible in the inside of the body it is kept warm. Warmth, exercise, and certain drugs (diaphoretics) increase the calibre of (dilate) the blood- **The skin: its functions.**

vessels of the skin, and the blood contained in their interior is exposed to the air and cooled.

A small quantity of heat is lost by the air-passages, but the skin is responsible for by far the greater quantity lost.

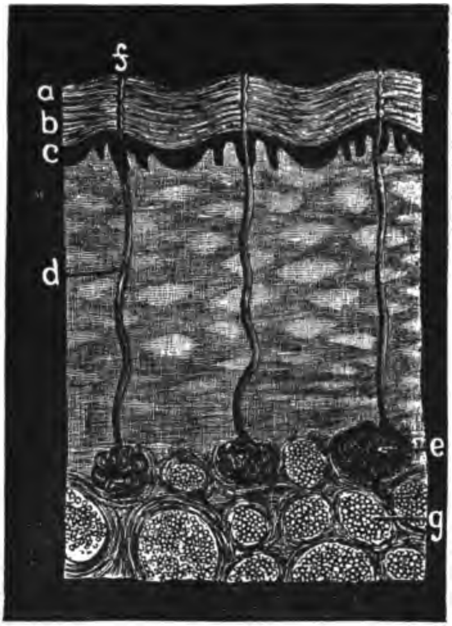


FIG. 10.—SECTION OF SKIN, TO SHOW:—

a. Free surface of skin.
b. Epidermis.
c. Deeper part of same.
d. Duct of sweat-gland.
e. Coiled up ends of same.
f. Opening of sweat-duct.
g. Fat-cells.

The cutis vera includes all below *c*; its deeper layers are more deeply shaded. The sweat-ducts open on the ridges into which the epidermis is elevated.

Division of the skin into two layers.

Epidermis.

The skin consists of two layers; the upper layer is called the epidermis, or scarf-skin, which is constantly being cast off in its upper strata, regeneration taking place from its deeper part. It is this layer which is raised by a blister when fluid accumulates below. The epidermis varies very much in thickness; it is very thick in the palm of the hand

and in the sole of the foot, where special protection is required.

The lower layer of the skin is known as the true skin (cutis vera), or dermis, and it is complex in structure. It is raised up into little projections, or papillæ, on the surface, some of which contain the structures that are concerned in the sense of touch (tactile corpuscles). The cutis vera contains many blood-vessels and nerves. **Cutis vera.**

The waste material is excreted by sweat-glands, which secrete the sweat. These glands consist of long coiled-up tubules, which open on the surface of the epidermis. They are very numerous, and are found in almost every part of the skin. They are said to be most numerous on the palm of the hand, where they probably number from two to three thousand to the square inch, and fewest in the skin of the back (about four hundred to the square inch). The diagram (fig. 10) represents a section of the skin, showing these glands and their apertures on the surface of the epidermis. The skin contains also another set of glands, called sebaceous glands. They secrete an oily material, and are connected almost entirely with the depressions in the skin in which the hairs are lodged (hair-follicles), into which, for the most part, their ducts open. **Sweat-glands.**

FIG. 11. — DIAGRAM TO SHOW A HAIR-FOLLICLE CONTAINING A HAIR.

A sebaceous gland is represented opening into the follicle on either side.

Finally, we must mention two structures belonging to the skin—namely, the hair and the nails—which must be regarded as special modifications of its upper layer, the epidermis.

Hairs are found on nearly all parts of the skin, varying in colour, size, and consistence. The root of the hair is implanted in the hair-follicle (fig. 11), which is simply an invagination (pushing in) of the true skin, lined by the epidermis, just as we might push in the tip of the finger of a glove. At the bottom of the follicle is a papilla (projection of the **Hairs.**

true skin), on which the hair is planted. The varieties in the colour of the hair are due to colouring-matter (pigment) contained in the spaces between the fibres of each hair. The change in colour of the hair to grey or white is caused by this pigment ceasing to be produced, when the spaces become filled with minute air-bubbles.

Nails.

The nails are of a horny structure, and are attached firmly to the cutis vera by a part called the root. They are placed on the backs of the last phalanges of the thumbs, fingers, and toes. The half-moon (lunule) at the base of the nail is due to this part of the nail being thinner than elsewhere. The borders of the nails (especially of the nail of the great toe) sometimes tend to curve inwards, giving rise to that painful affection ingrowing nail. The nurse will sometimes notice clubbing of the ends of the fingers and the nails in certain chronic diseases, especially heart disease and phthisis. This is due to the end of the finger becoming enlarged, probably from defective circulation of the blood in it.

Ingrowing nail. Clubbing of nails.

CHAPTER VI.

THE NERVOUS SYSTEM AND THE ORGANS OF SPECIAL SENSE.

WE shall conclude our sketch of the human body with an account of the nervous system and its various parts. As, however, this is the most complex and the most difficult part of the body to understand, and the part about which least is known, we can only give a general outline of the nervous system and its mechanism.

Division of nervous system into two parts. It is most conveniently divided into two parts: (1) the cerebro-spinal system, which includes the brain and spinal cord and the nerves arising therefrom; and (2) the sympathetic system, which consists of two cords running down each side of the body from the base of the skull, through the thorax and abdomen, to converge in front of the coccyx. These cords contain swellings at intervals in their length, called ganglia. In the thorax, the abdomen, and the pelvis these ganglia, together with numerous branches derived from the cords, become aggregated to form a network, or plexus, one in each of these three cavities. The sympathetic system communicates freely by its branches with the cerebro-spinal system. Its chief use is to supply the internal organs and the coats of the blood-vessels with nerve-influence.

The cerebro-spinal system must now be described in greater detail.

The brain and its membranes. The brain lies in the cranial box, covered by three membranes,—an outer one, the dura-mater; a middle one, the arachnoid-mater; and an inner one, the pia-mater. These three membranes are collectively known as the meninges, and they enclose the spinal cord as they do the brain.

Divisions of the brain. The brain is divided into four parts: (1) the large brain, or cerebrum; (2) the little brain, or cerebellum; (3) the

the foramen magnum to the first lumbar vertebra, where it ends in a thread. It lies loosely in the spinal canal. It is thicker in the cervical region of the spine (cervical enlargement) and in the lumbar region (lumbar enlargement), where the nerves for the upper and lower limbs respectively are given off.

The cord is cylindrical in shape, and is divided by an anterior and a posterior cleft into two equal halves. In its centre is a small canal, which is continuous with the various cavities in the brain. Between the arachnoid and pia-mater in the skull and in the spinal canal is contained the cerebro-spinal fluid, which acts as a water-bed for the brain and spinal cord, and thus protects them from being shaken. In fracture of the base of the skull this fluid may be discharged from the ear, and is always a symptom of much importance in this injury.

Cerebro-spinal fluid.

The last portion of the nervous system which calls for description is the system of nerves which emanate from the brain and spinal cord. They are divided into cranial and spinal nerves, terms which explain themselves. The former pass through holes in the skull, and the latter through holes in the vertebræ on each side.

Division of the cerebro-spinal nerves.

Cranial nerves.

We will take the cranial nerves first. They consist of twelve pairs, and arise from the under surface of the brain, all except the first four pairs springing from the medulla oblongata.

These nerves are concerned in the supply of the special sensations of smell, sight, hearing, and taste, in the supply of common sensation, and in the supply of motion to various parts.

The following table gives their names in numerical order, from before backwards, with their respective functions :—

Names of the cranial nerves in their order.

I.	Olfactory	nerve	(sense of smell).
II.	Optic	„	(sense of sight).
III.	Oculo-motor	„	(motor to eyeball).
IV.	Trochlear	„	„ „ „
V.	Trigeminal	„	(motor and sensory).
VI.	Abducent	„	(motor to eyeball).
VII.	Facial	„	(sense of taste and motor).
VIII.	Auditory	„	(sense of hearing).

IX.	Glosso-pharyngeal	nerve	(sense of taste; sensory).
X.	Pneumogastric	„	(motor and sensory).
XI.	Spinal accessory	„	„ „ „
XII.	Hypoglossal	„	(motor to tongue).

I. The olfactory nerve is concerned in supplying the special sense of smell. Passing through little holes in the ethmoid bone, it is distributed to the nose.

II. The optic nerve is the nerve of sight; it passes through a hole in the sphenoid bone, and enters the back of the eyeball.

III. The oculo-motor nerve is the motor nerve for four of the six muscles which move the eyeball.

IV. The trochlear nerve supplies one of the two remaining muscles of the eyeball, and receives its name from the fact that the muscle which it supplies works in a little pulley (trochlea).

V. The trigeminal nerve is both a sensory and a motor nerve. It has three large divisions, two of which supply sensation to the skin of the face and other parts in the vicinity. The third division is a motor nerve for the group of muscles which are engaged in mastication of the food, and a sensory nerve for the front part of the tongue. The trigeminal nerve is the largest of the cranial nerves. This is the nerve which accounts for the pain of neuralgia of the face and of toothache.

VI. The abducent nerve (Lat. *ab*, away; and *duco*, I lead) supplies the remaining muscle of the eyeball, the external rectus, which draws away the eyeball from the nose to the outer part of the orbit. Hence the name of the nerve.

VII. The facial nerve is a motor nerve supplying the muscles which give to the face its different expressions (muscles of expression). It also, however, supplies, in part with the ninth nerve, the sense of taste through one of its branches.

VIII. The auditory nerve is the nerve which supplies the sense of hearing. Leaving the skull in company with the facial nerve, it goes to the "inner" ear, where it ends in a complex manner.

IX. The glosso-pharyngeal nerve supplies the tongue

and pharynx with sensation; but, as we have already said, it also assists in supplying the sense of taste.

X. The pneumogastric nerve has a wide area of distribution. The name of the nerve is derived from two Greek words, signifying the lung and stomach respectively, both of which organs it supplies. In addition to this it also goes to the heart, the gullet, the larynx, and other parts. This nerve accounts for the disturbance of the heart's action which so commonly occurs when the stomach is overloaded, or its functions are otherwise interfered with.

XI. The spinal accessory nerve is both a motor and a sensory nerve, supplying two large muscles in the neck. One of these muscles (sterno-mastoid), which goes from the breast-bone and clavicle to the bony point which can be felt behind the ear, can be seen in many people. It is this muscle which is generally at fault in the affection known as wry-neck, where the head is drawn over towards the shoulder of one side. For its relief the muscle may have to be divided just above the clavicle, or the nerve stretched or divided at the point where it enters the muscle. Operation is only resorted to when other measures fail.

XII. The last cranial nerve, the hypoglossal, is the source whence the tongue derives its motion.

Spinal nerves.

The spinal nerves consist of thirty-one pairs, corresponding to the vertebræ in number, after which they are named, except in the cervical and coccygeal regions. Here they number eight and one respectively, the number of vertebræ, it will be remembered, being seven in the cervical and four in the coccygeal regions. They arise from the cord on each side by two roots, one leaving the cord in front (anterior) and one behind (posterior). These roots unite to form one trunk, which then divides into anterior and posterior divisions, the former to supply the front and the latter the back of the body.

This is seen in the diagram (fig. 13), which shows the cord cut across. The H-shaped figure represents the "grey matter," from the anterior and posterior ends of which are seen springing the roots of a spinal nerve. Regarding these roots, a brilliant discovery was made by Sir Charles Bell, who showed that the anterior root was concerned with motion and the posterior with sensation. The spinal

nerves are therefore mixed nerves, as we have seen certain of the cranial nerves to be.

Cervical, lumbar, and sacral spinal nerves.

In the cervical, the lumbar, and the sacral regions of the spine the anterior divisions of the nerves unite to form networks, or plexuses, from which the nerves of the upper and lower limbs are derived.

Chief nerves of the upper limb.

The chief nerves of the upper limb are the circumflex, which supplies the shoulder and certain muscles in its vicinity; the musculo-spiral, which winds round the humerus, and supplies muscles in the upper arm and around the elbow, and by its two branches part of the fore-arm and hand; the median, which is chiefly engaged in supplying the muscles and skin of the front of the forearm and hand; and the ulnar, distributed to the inner side of the forearm and hand.

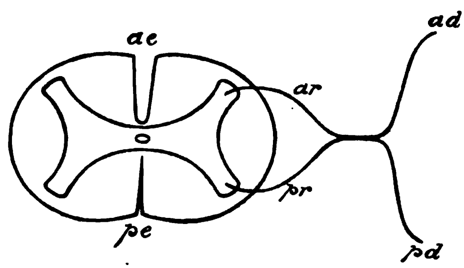


FIG. 13.—Diagram of section through spinal cord, showing the two roots of a spinal nerve, springing respectively from the anterior and posterior parts of the cord, coalescing, and then dividing into anterior and posterior divisions.

a e. Anterior end.	*p r.* Posterior root.
p e. Posterior end.	*a d.* Anterior division.
a r. Anterior root.	*p d.* Posterior division.

The nerves are only shown on one side.

Chief nerves of the lower limb.

In the lower limb the more important nerves are the anterior crural, which supplies the front of the thigh; the obturator, which goes to the hip- and knee-joints, and supplies certain muscles, which act by drawing the limbs inwards towards the middle line of the body (adductors); and the great and small sciatic. These last supply the back of the thigh, the former going to the hamstring muscles (a set whose action is to bend the leg on the thigh, and which can easily be felt at the back of the knee, when the leg is bent, as cord-like structures), and the latter supplying the skin in this region.

Dorsal spinal nerves.

The dorsal spinal nerves, which do not form plexuses, are distributed to the walls of the chest; and since they

run between the ribs, they are known as intercostal nerves (Lat. *inter*, between; and *costa*, a rib).

Method of action of the nervous system. The method of action of the nervous system must now be briefly enquired into.

Functions of the brain. The brain is the seat of spontaneous action and of intelligence. It issues commands, which are carried to the muscles along the nerves. For example, when we speak an impulse is started by the will, and this passes to the medulla, and then out through the cerebro-spinal nerves to the muscles which are required for the act. This is a voluntary motor action. But the brain, in addition to issuing commands, receives impressions through the sensory nerves.

Sensation. What we know as sensation is the result of such an impression, caused by the excitement of a sensory nerve. For sensation, however, there must be consciousness. When a person is under the influence of chloroform, for example, the sensory nerves may be excited; but there is no sensation, because there is no consciousness. The sensations of sight and hearing depend on impressions conveyed by the optic and the auditory nerves respectively to certain parts of the brain, as a result of excitement of these nerves by rays of light and by waves of sound.

Nerve-centres of the medulla. The most important part of the brain is undoubtedly the medulla oblongata, in which are located the nerve-elements, which we are accustomed to speak of as centres, that control the functions of life. They include the centres for the respiratory movements (respiratory centre), for the action of the heart, for swallowing, for speech, and so on.

The nerve-elements concerned in the senses of sight, hearing, taste, touch, and smell are situated in the large brain, as are also the centres for the movements of the head and the upper and lower limbs.

Frontal lobes of the cerebrum. The front part of the large brain (frontal lobes) is probably largely concerned in intelligence.

Cerebellum. The cerebellum, or little brain, has to do with regulating the movements of the body. When it is affected by disease, the power of balancing the body becomes more or less impaired.

Functions of spinal cord. The spinal cord conducts the messages, or, as we prefer to say, the impulses, from the tissues to the brain, and *vice versa*, just as a telegraph-wire carries or transmits

electrical impulses. For example, when we move the hand an impulse passes from some portion of the brain through the medulla into the spinal cord, and thence through the anterior roots of those nerves which go to the upper limb.

Crossing of motor impulses in the medulla.

But these impulses do not keep to the same side as that on which they started, but cross over in the medulla oblongata to the opposite side; so that when we move our right hand the impulse has had its origin in the left side of our brain. Not only do impulses of motion cross over, but also those of sensation. If we prick our right thumb, a sensory impulse is conveyed to our brain, not to the right but to the left side. It used to be believed that the impulses of sensation crossed on entering the spinal cord, but it is now held that they too cross in the medulla, a little higher than the motor impulses. When we come to speak of paralysis, we shall find that the disease is on the opposite side to that which is affected by the paralysis. The path of these impulses is shown in the diagram (fig. 14), the thick unbroken lines representing the course of the motor impulses, and the thin interrupted lines the sensory impulses. It is obvious that if these motor and sensory paths be interrupted either in the brain, the cord, or in the nerves after they leave the cord, a corresponding degree of paralysis will result in the case of the motor nerves, and of loss of sensation (anæsthesia) in the case of the sensory nerves, as the impulses cannot now be carried to and fro.

Crossing of sensory impressions in the medulla.

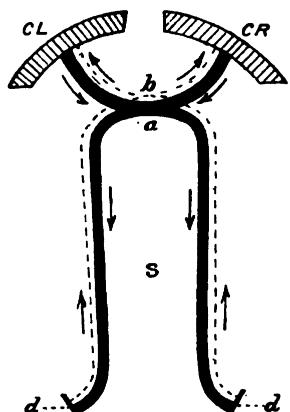


FIG. 14.—Diagram to show the course of impulses of motion and sensation and their crossing in the medulla (*a* and *b*). Thick black lines indicate "motor" and thin interrupted lines "sensory" impulses. Arrows mark the direction taken, motor impulses descending and sensory impulses ascending.

CL. Cerebrum, left.
CR. Cerebrum, right.
s. Spinal cord.
d. Skin and muscles.

Path of motor and sensory impulses shown diagrammatically.

We have so far referred to the spinal cord as being the medium for the transmission of nervous impulses

between the brain and the various parts of the body; but it has also another function—namely, to transform impulses of sensation into impulses of motion apart from the brain.

Reflex action.

This power of the spinal cord is known as reflex action, of which there are many examples. Suppose the front of the knee be smartly tapped, the leg will generally be found to jerk forwards, and this occurs quite involuntarily as a rule. What happens in this case? A message is transmitted along the sensory nerve which supplies this part of the body to the spinal cord. It is passed on to the motor-nerve fibres, whence it is conveyed by the motor nerves to the muscles which jerk forward the leg.

Reflex action well illustrated in experiments on the frog.

The presence of reflex action apart from any action of the brain is well shown in the case of the frog. If the

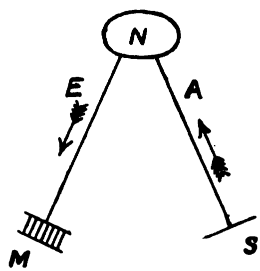


FIG. 15.—Diagram to illustrate reflex action.
M. Muscle; *S.* Skin; *E.* Motor nerve; *A.* Sensory nerve; *N.* Nerve-cell.

animal is decapitated, or if the spinal cord be cut across close to the head, consciousness is of course lost, and no movements occur so long as the animal is not touched. Suppose, however, a toe be pinched or a drop of vinegar be placed on the skin of the leg, the limb is at once drawn up to the body. The same thing happens here: the sensory nerve is excited; an impulse is transmitted to the cord, by which it is resolved into an impulse of motion. This is transmitted to the muscles by the motor nerves, and the movement or series of movements is established. Reflex action may be very easily figured diagrammatically (fig. 15) by representing a group of nerve-elements, which we may conveniently regard as one or more nerve-cells, and by drawing two nerve-fibres, one going to the cell (sensory), and one leaving it and going to a group

of muscles (motor). Among the reflex actions which take place in our bodies may be mentioned swallowing, and the movements of the intestines (peristalsis), by which the contents are transmitted along the canal. **Examples of reflex action which are constantly taking place in our bodies.**

The organs of special sense. We shall conclude our study of the nervous system with a short account of the organs of special sense. The nerves of special sense have already been mentioned.

Sense of smell. The upper part of the nose, where the olfactory nerves are distributed, is concerned in the sense of smell. The nostrils lead into the cavities of the nose, which are separated by a partition (septum). These cavities open posteriorly (posterior nares) into the pharynx. The smells we perceive are carried by the air to the upper part of the nose, where the endings of the olfactory nerves are stimulated, and an impression or perhaps several impressions are carried to that part of the brain which has to do with the sense of smell. This gives rise to the sensation which we appreciate as smell.

When we are desirous of perceiving a smell more distinctly, we sniff; this facilitates the passage of the air containing the odour to the olfactory part of the nose.

Sense of taste. The organ of taste is situated in the tongue, the surface of which is raised into little projections called papillæ.

The nerves of taste end in little bulbs, called taste-bulbs, which are excited by substances dissolved in the saliva. Such impressions are carried to the area of the brain concerned in the sense of taste, and the sensation results. Taste and smell are closely associated; for when there is impairment of the sense of smell the sensation of taste is likewise diminished, as sometimes occurs in the case of a severe cold in the head.

Sense of touch. The sense of touch we have seen to lie in the little papillæ of the skin. It is also found in the mouth and in the nose. This sense is measured with regard to its acuteness in two ways: (1) by the smallest weight which can be perceived—this has been found to be most acute on the forehead and nose; and (2) the power of distinguishing two simultaneous impressions—this is most highly developed at the tip of the tongue, where the points of a pair of compasses only one twenty-fourth of an inch apart can be recognised as two impressions.

Sense of hearing. The ear, the organ of hearing, is divided into three parts:—

Division of the ear into three parts. (1) The outer ear, which includes the ear as the term is commonly understood (the auricle); and the canal of the ear, which extends to the drum (membrana tympani).

Tympanum. (2) Inside the drum of the ear is a cavity, called the middle ear, or tympanum. This is important surgically, as it is liable to become inflamed, when serious results may ensue, such as deafness, and even abscess of the brain. It communicates with the pharynx by a tube, which has been already referred to (Eustachian tube).

Auditory ossicles. The tympanum contains the three little bones (auditory ossicles), which we have already mentioned (see chapter i.). These tiny bones, which are as it were stretched across the cavity, move to and fro as one mass with the drum of the ear during the passage of the waves of sound.

Inner ear, or labyrinth. (3) The third part of the ear, known as the inner ear, or the labyrinth, is the most important, and at the same time the most complex, part of the organ of hearing; it is here that the auditory nerve ends.

Mechanism of the sense of hearing. The waves of sound are gathered in the cavity of the ear, or concha (Lat. *concha*, a shell), just outside the canal; they pass along the canal to the drum of the ear, where they are received and transmitted by the chain of little bones across the tympanum to the labyrinth.

The labyrinth contains fluid, and by the quivering of this fluid, arising from these vibrations, the endings of the auditory nerve are affected; the resulting impressions are conveyed along the nerve until they reach that part of the brain excitement of which results in the sense of hearing. This special part of the brain we speak of as the centre for hearing, or the auditory centre, just as we speak of the centres for smell, taste, touch, and sight.

The eye: muscles of the eyeball. The eye lies in the cavity known as the orbit, and, as we have seen, is moved by six muscles. Of these we shall briefly refer to four, which are known as the recti, or straight muscles. The diagram (fig. 16) will explain their position and the direction in which they act. They afford the eyeball a free range of movement. The eyeball is

Conjunctiva. covered with a delicate membrane, the conjunctiva, which is folded over the inner surfaces of the upper and lower lids.

Optic nerve. The optic nerve, which springs from the brain, leaves the skull by a hole at the back of the orbit, and enters the eyeball from behind, not in the centre, but slightly to its

inner side. It then spreads out into a thin delicate membrane, the retina, which covers the inside of the eyeball in its posterior two-thirds. **Retina.**

The eyeball may be regarded as consisting of three coats, or tunics:— **Three coats of the eyeball:**

(1) The sclerotic constitutes the outer coat. It is hard and tough, and is popularly known as the white of the eye. In front it becomes transparent, to allow the passage of the rays of light. Here it is known as the cornea. **(1) Sclerotic.**

(2) The middle coat is called the choroid. In this coat are contained the blood-vessels of the eyeball. **(2) Choroid.**

(3) The inner coat is formed by the retina, which we have already mentioned. **(3) Retina.** Behind the cornea lies the crystalline lens. **Crystalline lens.** Between these structures is a sort of curtain, which is attached by its edges to the junction of the cornea and the sclerotic. This curtain is called the iris. **Iris.** It contains a round hole, the pupil. **Pupil.** Now, this hole can be made larger or smaller by two sets of muscles. When the iris is spread out or expanded, the pupil becomes small (contracted); **States of the pupil.** when, on the other hand, the iris shrinks, the pupil becomes large (dilated). In later chapters we shall have to speak of contracted and dilated pupils.

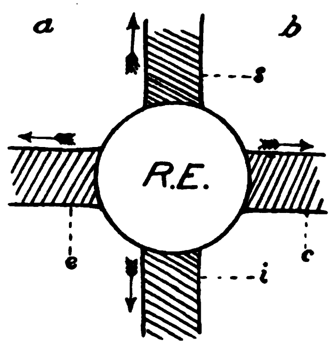


FIG. 16.—Diagram to show the position of the four recti muscles, superior, inferior, internal, and external. The arrows represent the direction of their action.

a. Outside of orbit.	*e*. External rectus.
b. Inner side ,,	*i*. Inferior rectus.
c. Internal rectus.	*s*. Superior rectus.

R.E. Right eye.

There are two spaces between the back of the cornea and the lens, which are separated by the iris. These spaces are known as the chambers of the eye, and contain a fluid, the aqueous or watery humour. **Chambers of the eye.** This fluid passes from the one chamber to the other through the pupil. **Aqueous humour.** Behind the lens lies a large cavity, which is filled with a

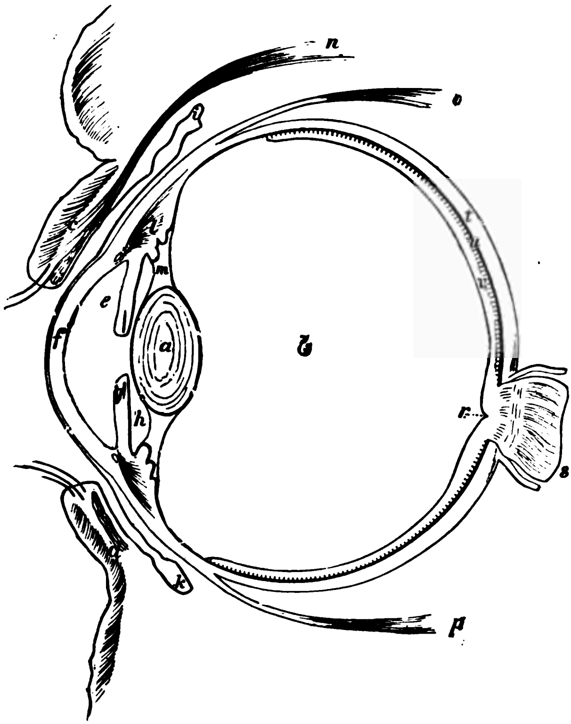


FIG. 17.—VERTICAL SECTION OF THE EYEBALL AND EYELIDS.

a. Crystalline lens.
b. Vitreous chamber, containing vitreous humour.
c. The upper and *d* the lower eyelids.
e. Anterior chamber, filled with aqueous humour.
f. Cornea.
g. Iris.
h. Posterior chamber.
i. Upper and *k* lower cul-de-sac of the conjunctiva.
l. The ciliary muscle.
m. The suspensory ligament.
n. Section of the levator palpebra superioris muscle.
o. Section of the superior rectus muscle.
p. Section of the inferior rectus muscle.
r. The optic disc.
s. Section of the optic nerve.
t. Sclerotic coat.
u. Choroid coat.
v. Retina.

Vitreous humour.

jelly-like substance, the vitreous (glassy) humour, which serves in part to maintain the shape of the eye.

The eye has been well likened to a camera obscura.

There is a dark chamber behind, with a clear window in front (cornea) to admit the light, a curtain (iris) to regulate the size of the opening (pupil) through which the light enters, and a lens to focus the light on to the receiving-surface (retina). **The eye compared to camera obscura.**

Having described the structure and contents of the eyeball, let us now briefly consider the question of vision. **Vision.**

The rays of light are focussed on the retina. But the sensation of light can only come from the brain. What the retina does is to transform the vibrations of the atmosphere into some form of stimulus, which, by exciting the endings of the optic nerve, causes impressions to be sent to a certain part of the brain, which result in the sensation of sight.

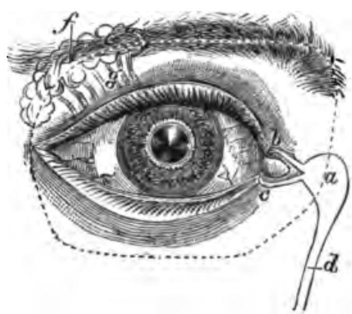


FIG. 18.—LACHRYMAL APPARATUS, RIGHT SIDE.

a. Lachrymal sac.
b. Upper canaliculus.
c. Lower canaliculus.
d. Nasal duct.
f. Lachrymal gland.
g. Lachrymal ducts.

Lachrymal apparatus.

Lastly, we must briefly describe the apparatus for the secretion and removal of the tears. This is known as the lachrymal apparatus (Lat. *lachryma*, a tear). The tears are secreted by the lachrymal gland, placed in the outer part of the orbit. They are conveyed from the gland by little ducts, which open on to the conjunctiva. By the movements of the eyelids they are directed to the inner side of the eye, where they pass through two minute holes (puncta lachrymalia) into two little canals (upper and lower canaliculi). These in their turn open into a cavity (the lachrymal sac), which represents the upper end of the nasal duct, by which they are conveyed into the nose. The diagram (fig. 18) will make the various parts of the apparatus more clear.

PART II.

CHAPTER VII.

THE MANAGEMENT AND NURSING OF THE SICK.

It would be impossible to consider here fully all the details of the management and nursing of the sick. This can best be learnt in the hospital ward or sick-room. All that will be attempted will be to lay down some principles which may guide the nurse in her daily work, and help her to benefit by the practical part of her training.

Management of the hospital patient. It will be most convenient to consider first the management of the hospital patient and his surroundings.

The wards. The wards of a hospital differ in many ways in their general arrangements and accommodation, according to the length of time the hospital has been in existence. Within the last few years many improvements have been made in the building, sanitary arrangements, and general administration of our hospitals, which of necessity give the newer institutions many advantages which the older hospitals lack.

A hospital ward should be lofty, bright, cheerful, and above all scrupulously clean. It is desirable to obviate overcrowding as much as possible. The beds should be separated by sufficient space to allow of free access to each patient. Where possible it is an advantage to have a window between each bed which should open top and bottom. The floor should be polished, and is better uncarpeted. Pictures on the walls should not be placed too high. It is advisable not to have much furniture

in the ward. The necessary appliances and other requisites which are in regular use are kept in a suitable place at one end of the ward. Dressings and medicines are placed in their respective cupboards: the latter must be kept under lock and key. Flowers and plants may be used whenever possible, to render the ward bright and cheerful: the former should not have a powerful odour, and must be removed at night. Over the patient's bed should be placed a bracket to contain the medicine. Each medicine bottle should be suitably labelled, and the patient's name legibly written thereon. Above the bed is also placed the patient's card, on which the house surgeon writes the name, age, occupation, and prescription, together with a history of the case. On a patient's discharge from the hospital this card is removed and preserved. At one end of the ward there is usually a ward-kitchen, and at the farther end a bath-room and lavatories.

Ventilation. We must now consider the question of ventilation. By this is meant the removal of vitiated air and its replacement by fresh air. It is of the greatest importance to attend to the proper ventilation of a ward. This is admirably carried out by the ordinary open fireplace. The air in the neighbourhood of the fireplace is drawn towards the chimney, and its place is taken by a fresh supply. This by itself is, however, hardly sufficient, and must be supplemented by windows and other ventilators. It should be possible so to arrange the ventilation of a ward that a draught is prevented, and this is best done by opening the window at the top. The fresh air which comes in gradually mixes with the air of the room. Ventilators are generally placed near the ceiling of the ward on the outside wall, and may be opened and shut as desired. We should remember that the sick require more fresh air than the healthy. It is generally stated that twelve hundred cubic feet of air are required for each patient in a ward, but we shall see when we come to speak of the management of fever patients (see chapter xxi.) that a more liberal supply of air is necessary in such cases, as much as two thousand cubic feet per head being requisite in the ward of a fever hospital. In the summer the windows may generally be opened top and bottom, but in the winter it will usually only be possible to open them at the top. At

night it is as well to have one or more windows open a little at the top, according to the number of patients in the ward. It is, however, in the early morning that ventilation is so necessary. At this time the air of the ward, if examined, would be found to be very impure, containing a considerable amount of carbonic acid gas, and probably numerous organisms and particles thrown off from open wounds. The patients should be directed not to open or shut the windows or to interfere with the ventilators. This duty devolves on the nurse. Hospital patients are sometimes very averse to having windows opened, and it will often be necessary for the nurse to be firm on this point. It is always easy to put a wrap round a patient's shoulders, if a complaint is made in this connection. In any case of doubt as to the advisability or otherwise of opening a window or windows the house surgeon should be consulted. In cases where the atmosphere of the ward is obviously tainted it is advisable to purify the air by burning some cascarilla chips in a shovel, or even a little brown paper. Again, to mitigate evil odours arising from a particular case, some bags of charcoal hung round the bed will be found to absorb the offensive gases, or the charcoal may be placed in pans under the bed.

Temperature. The temperature of the ward is regulated by the ward thermometer, which should be placed in a spot convenient for observation. The temperature should be kept at or about 60° Fahrenheit. It is, however, generally advisable to keep the ward a little cooler by night than by day.

Heating. Heating a large room is best done by hot pipes, but the open fireplace is cheerful, and, although somewhat extravagant, it has the advantage of serving both as a ventilator and as a heat-producer. It may be necessary to supplement the open fireplace by stoves, or hot air or water pipes. In many hospitals now the closed fireplace is in use; it is usually situated in the middle of the ward. In special cases the temperature of the ward may require to be raised and the moisture of the air increased by the steam-kettle or other apparatus. It is sometimes difficult to keep the ward cool in the summer. The blinds should be drawn down before the sun becomes very powerful. In some

cases it may be possible either to use sun-blinds or to improvise them by hanging blinds outside the windows to keep the sun off the glass.

Light and cleanliness. In addition to the ventilation and temperature of the ward two other points must be insisted on—namely, the importance of light and cleanliness.

Light is a most valuable adjunct in the nursing of the sick. We have only to consider the animal and vegetable kingdoms to realise that for growth and health light is a necessity. How much more then is this the case in sickness! Therefore we must favour the admission of as much light as possible, except in cases where it may be contra-indicated.

It is almost unnecessary to impress on the nurse the necessity of preserving the utmost cleanliness and neatness in the ward; the floor, the walls, and the furniture must be regularly attended to, and no dust allowed to accumulate. An untidy and a slovenly ward generally signifies slovenly and bad work. The cleaning and tidying of a ward should be completed in the early morning before the doctor's visit. The qualities of a good nurse have already been pointed out, and it is unnecessary to say much about the duties of the nurse in the ward, as it is only in the ward that they can actually be learnt.

Nursing staff. The staff of nurses attached to a ward or wards usually consists of a sister or head nurse, a staff or second nurse, and one or more probationers, according to the number of patients. Each nurse should have special duties assigned to her, the head nurse being responsible for the proper carrying out of all the duties and for the observance of order and discipline.

Nurse's costume. The nurse's costume should consist preferably of some washing material or else of plain serge, which can be easily kept clean. Strong but quiet shoes should be worn. It is a mistake to wear thin slippers, which are very apt to tire the feet and may cause flat-foot.

Exercise and recreation. It is most important for the nurse to obtain her regular exercise and recreation, without which she will find herself unable to properly fulfil her duties. She should cultivate some hobby, if possible, to which her thoughts can be directed in her off-duty time. A nurse should be rigidly punctual in going on and in coming

off duty, and her daily work and recreation must be methodically planned. Method in her work will enable her to perform her duties with the least labour and in the shortest time.

Attitude of the nurse towards her patients.

Turning next to the attitude to be adopted by the nurse towards her patients, the utmost kindness and sympathy must be combined with firmness and discipline, without which the ward work cannot possibly be carried on. The secret of success in dealing with patients mainly depends on the exercise of tact, and it has been well and truly said that a well-trained charge nurse can keep order in a men's ward better than a military ward-master. Such a nurse will be far more respected and appreciated than one who neglects discipline. It is almost needless to say that the nurse should not openly favour patients, but should endeavour to minister to all alike according to their requirements, whether they be grateful or the reverse. Cheerfulness is of great value in nursing the sick, and every nurse must endeavour to cultivate a bright and cheery manner towards her patients, combined with a gentle and quiet demeanour.

It is a good rule to avoid as far as possible, especially in serious cases, discussing medical subjects in front of patients. This is of course done by the doctor for the purpose of bedside teaching, but every care is taken not to make any remarks or allusions which may be at all likely to alarm or upset patients. It cannot be too strongly borne in mind that we are treating not merely diseases, but human beings.

A patient on admission should be made to feel at home as much as possible. His bed-ticket is duly filled up, and his medicine sent into the ward from the dispensary. As already said, the filling up of the card usually falls to the house surgeon, but the nurse may be called upon to do this.

Presuming the nature of the case to allow of it, a warm bath should be administered on admission; and here a word of caution is necessary. On no account should children ever be left alone in a bath; and this rule may with advantage be applied to most adult patients. The temperature of the water is ascertained by the bath thermometer.

Temperature of baths.

It may here be pointed out that baths are classified according to their temperature as follows:—

Cold, below 70° F.
Tepid, about 90°.
Warm, about 100°.
Hot, a temperature of 106° or still higher.

The patient's clothes are either given to his friends to take home if he is likely to be in bed a considerable time, or put away in a locker or cupboard provided for that purpose. Sometimes they may require to be "stoved" or subjected to other modes of disinfection. Money and articles of value are best handed over to the charge nurse, and always any eatables which may have been brought in.

The nurse should keep a ward-book, in which to enter the name of every patient, with the age and address on admission. The diet must be ascertained and entered on the card.

Recording of the temperature, pulse, and respirations. Clinical thermometer.

As soon as the patient is in bed the temperature, pulse, and respirations must be taken and recorded. The temperature is taken by the thermometer, which is a graduated glass tube, ranging from 90° to 110° or higher. Each degree is divided by four smaller transverse lines to render the reading more accurate. These small lines correspond to the even numbers between one and ten, and the spaces between to the odd numbers. If, for example, the column of quicksilver reached the level of the third line between 101° and 102°, we should read the temperature as 101·6°, as shown in the accompanying illustration:—

FIG. 19.—CLINICAL THERMOMETER.

It is sufficient to say that the quicksilver contained in the bulb of the glass is made to expand and rise or to contract and fall by the application of heat and cold respectively.

The temperature is commonly taken in the mouth or axilla, the former site being more convenient when the patient is up and dressed. With children it is often better to take it in the rectum or fold of the groin. When the temperature is to be taken in the rectum the patient should lie on his side, and the thermometer be introduced for two inches into the bowel. The patient must be kept quite still, to prevent it slipping into the bowel or being broken. The temperature of the body in health is not constant, but for all practical purposes it may be stated to be about 98·4° in the mouth and armpit, and about 99° in the rectum. The thermometer should be left in position about five minutes, but in cases of doubt it is a good rule to leave it in position until the quicksilver has been stationary for a few minutes. Patients who are having their temperature taken for the first time must be enjoined to keep quite quiet, and it should be pointed out to them that the thermometer is a fragile and easily broken instrument. When a high temperature is recorded, or a great fall takes place, it is necessary to confirm the observation by taking it in another part of the body, or to make use of another thermometer, and compare the readings. On each occasion after using the thermometer the quicksilver should be shaken down below the normal. After use, and when not in use, thermometers should be placed in a glass containing a small pledget of cotton-wool soaked in carbolic lotion (1-20). Before being used again they must be cleansed and dried.

The temperature should be systematically recorded twice daily in each patient. In acute and special cases a four-hourly or an even more frequent record must be kept. The nurse will soon learn how to keep a temperature chart neatly, and how to draw up a "four-hour" chart. A sudden marked rise or fall of temperature must be promptly reported to the house surgeon.

The urine. On the day of admission the nurse should obtain a specimen of the urine, and set it aside in a urine-glass for examination, the glass being covered with a piece of paper and labelled with the patient's name. Urine-glasses must be thoroughly cleansed after use. This subject will be considered in a future chapter (see chapter x.).

The early morning will be occupied with the washing, making of beds, and general arranging of the patients.

Those who are able to get up and are physically fit will not only look after their own toilet, but assist the nurse in the general work of the ward, such as waiting on others confined to bed, helping with meals, etc.

The charge nurse will receive the report of the night nurse, so as to be able to inform the doctor of the condition of the patients on his visit.

In the surgical wards dressings, lotions, and all other requisites for the doctor's use should be in readiness, it being the object of the nurse to have at hand everything which is likely to be required for each individual case.

The charge nurse accompanies the doctor on his ward visit; the other nurses, when possible, should also go round with the doctor, not only to render assistance when called upon, but to learn what they can about the cases committed to their charge.

As a rule the general work of the ward is finished by the patients' dinner-hour, although this cannot always be accomplished.

While the doctor is in the ward all patients who are up should remain by their bedside until they have been seen by him. All orders given by the doctor during his round, including any alterations made in medicines, must be carefully noted and carried out with the least possible delay.

The nurse should not allow patients to go out into the garden or grounds without permission from the doctor.

It is generally advisable for the nurse to communicate with the friends of patients to be discharged, or to see that they do so themselves, in cases where they are unfit to leave the hospital alone.

The nurse should prepare and keep an inventory of articles which patients are required to bring with them for their use in hospital. The patients should settle down for the night about 8 p.m., and the charge nurse must, before going off duty, write her report for the night nurse. In this report she will mention the number of new cases which have been admitted, their nature, and any special treatment to be carried out during the night, such as the application of poultices, ice-bags, passing of the catheter, etc. It will be more satisfactory to combine the written with the verbal report.

Day nurse's report.

The night nurse. A few words must now be said about the night nurse. It may be thought that the position of the night nurse is a less responsible one than that of the day nurse; but, if anything, the responsibility is even greater. It is during the night when many serious cases are at their worst, and when the nurse's resources may be taxed to the utmost to procure rest and sleep for her patient. The night nurse must be most particular to obtain her proper exercise, recreation, and sleep. She should have a good meal before coming on duty. She receives the report from the day nurse, and takes care to understand thoroughly any line of treatment which has been ordered. Patients should not be roused when asleep to take medicine or nourishment except by the doctor's orders.

As a rule the surgical wards provide most work through the day and the medical wards by night. When the night nurse requires any help she must at once summon one of her colleagues, and, if necessary, the house surgeon. This latter question the night superintendent usually decides.

The importance of observation. Before turning to certain details in the nursing of the sick there is one further point the nurse must not forget—namely, to use her eyes. This requires training. The power to observe and to report the results of observation correctly is one which doctors and nurses alike cannot acquire too thoroughly; and such observations, to be of value, must be carried out quietly without fidgeting the patient; in fact, the patient should be oblivious of them, or almost so. Thus the nurse will be able to answer questions concerning sleep, amount of nourishment taken, breathing, rate of the pulse, actions of the bowels, their character, and so on. A nurse may sometimes learn much merely from a patient's expression, and no opportunity should be missed of finding out as much as possible by use of the eyes alone.

The making of beds. The making of beds and the art of making patients comfortable in bed is one of the first duties which the nurse has to learn. It is an easy matter to make an empty bed, but by no means so easy to make a bed with a patient in it. The nurse must see that the bed-clothes are clean and dry, and that all sheets, etc., are properly aired. A good nurse takes a pride in making her beds neatly and keeping them tidy, for this adds so much to the

general appearance of the ward. It may be necessary to change the bed-clothes with as little disturbance of the patient as possible, and to accomplish this the patient may be gently lifted or turned on his side.

The draw-sheet. To prevent soiling of the bed-clothes the draw-sheet is commonly used. It reaches from the middle of the back to the knees. In changing, the soiled sheet is drawn gently from under the patient; the clean one—firmly tucked in on one side—is then rolled under and pulled tight on the opposite side. Often this has to be done without moving the patient at all.

Soiled linen of every description should be at once removed from the ward to the laundry, which is usually a separate building.

It is often most refreshing to have the pillows shaken up, and this should be done from time to time, especially in cases of severe illness.

Emergency bed. An emergency bed should always be kept ready made up, as the nurse can never tell when it may be required. After the death of a patient the bed and bedding must be thoroughly aired before being used again. Indeed, bedding should be aired under ordinary circumstances far more frequently than it usually is, though this applies more to district than to hospital nursing.

Bed-rests and pulleys. Bed-rests and pulleys are often used for helpless patients. The former are of much value in severe medical ailments such as heart and lung disease, where there is inability to completely lie down on account of the embarrassed breathing; and the latter to help such patients to raise themselves in bed.

It is in the case of helpless patients that a nurse finds so much difficulty in keeping the bed dry and comfortable, and every precaution must be taken against bed-sores, which are so liable to form in these cases, by rubbing and powdering the back over the bony prominences where pressure is exerted, but above all by dryness. This subject, however, will be referred to in greater detail in a later chapter (see chapter xi.).

The washing and sponging of patients in bed. Washing and sponging patients in bed requires to be undertaken by the nurse in acute and helpless cases. This must be done with the least possible exposure, and the body must be thoroughly dried to prevent a chill.

Bed-pans. Bed-pans are best made of white earthenware, and should be provided with well-fitting lids. After use they should at once be removed from the ward, emptied, rinsed with some disinfectant, and then dried. The motions may have to be preserved for the doctor's inspection. In this case the bed-pan should be placed aside in the lavatory, covered with a towel wrung out of carbolic lotion.

Urine-bottles. Urine-bottles are made of earthenware or glass. They should have wide necks to facilitate thorough cleansing. They should be emptied at regular intervals, and not placed under the bed, but by the bedside.

Water-closets, sinks, and basins. Water-closets, sinks, and basins in the lavatories must be kept perfectly sweet and clean by regular flushing and cleansing with a disinfectant such as Jey's fluid at least once a day.

Hot-water bottles. Hot-water bottles are often required. They should be carefully filled, and the screw tightly fixed to prevent leakage. They must be placed in a flannel bag, otherwise the skin may be easily blistered. Where bottles are not obtainable hot bricks answer admirably, but this applies rather to home nursing.

Ice-bags. Ice-bags must be securely stoppered. It is better to chip the ice in small pieces, on account of its weight. When applied to the head, as they often are, they may be attached to the head of the bed, and thus better kept in position.

Water-beds. Water-beds should be only half filled, and warm water used; this is done on the bed.

Air- and water-cushions. Air- and water-cushions are sometimes very serviceable where a water-bed is not necessary or cannot be obtained.

Sputum. Sputum must be carefully attended to. Patients should be provided with special receptacles, especially in cases of consumption, which must be regularly emptied. The nurse must understand that it is almost entirely through the dried sputum that consumption is spread. The expectoration-cup should contain a liquid disinfectant, such as carbolic acid (1-20) or perchloride of mercury (1-1000). After being emptied the vessels should be well scalded out and cleansed with washing-soda. Spitting into handkerchiefs or paper must be discouraged. Sputum is best destroyed, where practicable, by being burnt. Any expectoration is usually left until after the doctor's visit, and

vomit which has been ordered to be kept for inspection should be placed in a clean conical glass and covered over. It should not be left in the ward.

The last subject which remains to be discussed in connection with the nursing of the hospital patient is that of diet and feeding. We have said that the patient on admission is dieted according to the character of his illness and the requirements thereof. We shall discuss the subject of the diet with that of digestion in a later chapter, and shall constantly have to refer to this question elsewhere, but here we are thinking rather of the actual administration of nourishment. This is one of the nurse's most important duties. Patients who are up and about will take their meals at the table, but those who are in bed will often need to have their nourishment given at frequent intervals and in small quantities. Where digestion is impaired, as it so commonly is, it must be remembered that the appetite requires coaxing, and, as far as is possible in a general ward, the food should be well and neatly served. Those in bed should be provided with a crumb-cloth to prevent the crumbs getting into the bed. All food which is not eaten must be at once removed, and on no account wasted or left about. Patients must be strictly enjoined not to partake of any article of food surreptitiously, which may have been brought them by well-meaning but ill-advised friends. All such articles which may have reached the ward must be handed over at once to the charge nurse. The diet ordered by the doctor must be rigidly adhered to. In special cases the time at which food is taken, its nature and exact amount, must be recorded. No stimulants should be given by the nurse without order, except in cases of the greatest emergency, when she must promptly report to the doctor what she has given and the quantity. Extra articles of diet, including stimulants, are to be entered on the bed-card. Although the nurse cannot be expected to be a proficient cook, yet she will find a knowledge of cooking of inestimable value, and she should certainly make herself acquainted, if she has not already done so, with the elements of sick-room and ward cookery, including the preparation of artificially digested foods and of nutrient enemata.

Diet and feeding.

Stimulants.

The actual times in an acute disease to give nourishment

cannot be laid down. The doctor will give approximate rules for guidance, but it is here that so much depends on an intelligent and skilled nurse, who will sometimes have to decide for herself when to give and when to withhold food.

In feeding the sick it is customary to use a feeding-cup or spoon. The head should be gently raised and supported; but occasionally nourishment has to be given without moving the patient at all. By passing the spout of the cup or spoon to the back of the mouth swallowing takes place involuntarily, and thus it is possible to feed unconscious patients.

In conclusion there are many points in connection with the nursing of the sick which it is impossible to refer to here. Some of these will be mentioned in succeeding chapters and others in the Appendix.

Home nursing. Having considered at some length the management of the hospital patient and the nurse's duties in connection therewith, we must now turn to the subject of home nursing, both district and private. All that has already been said will apply, with a few slight alterations and modifications, equally to the private and district nurse.

Of course the social position and general mode of life will present the greatest extremes, and this is apt to make the work of the home nurse more irksome and difficult than that of her sister in hospital. It is true that a private nurse has as a rule only one patient; but this may not after all prove an unmixed blessing, for the management of this one person, especially if he belong to the higher classes of society, may call for the exercise of more resource and tact than a whole wardful of patients. The nurse is in this case far more exposed to the whims and caprice of her patient than she would be in hospital, and there is not the salutary discipline of the hospital ward to assist her.

The private nurse. We shall speak in the first place of the private nurse. It is customary for a nurse to undertake private work only after she has had a course of training in hospital; indeed most private nursing homes require a two or even a three years' certificate, and rightly so; for how can a nurse understand her duties unless she has been properly trained?

In hospital she learns order, cleanliness, punctuality, discipline, obedience to her superiors, and tact in dealing with patients. She works with all the necessary appliances within her reach, and has her superior officers to consult with and apply to in cases of difficulty. When she leaves the hospital for private work her position becomes a more responsible one. She still works under the doctor, but is left in complete charge of the case in his absence. Appliances are not always to hand as they were in hospital, and it is often necessary to utilise what is available to the best advantage.

The private nurse who, for the time being, resides in the house must be above all things cheerful, agreeable, and anxious to give as little trouble as possible. She must, in the doctor's absence, be entirely responsible for the well-being of her patient. She must supervise the preparation of his nourishment; be firm, yet courteous and dignified, in her attitude towards the members of the household; strict in regulating the visits of the members of the family and friends to the sick-room; and must rigidly adhere to the doctor's orders in this respect, especially where they are apt to be meddlesome and "would-be-wise."

As a rule the private nurse is well treated and respected, but she must be prepared to have to deal with ignorant and uncultured people, who will perhaps look on her in the light of a servant. She may have to take almost complete charge night and day, or may be on night or day duty only. Whatever arrangement is made in this respect, she must be even more particular than the hospital nurse in obtaining her recreation, food, and sleep at regular hours and in sufficient quantity, without which she cannot preserve her health and properly fulfil her duties.

Choice of the sick-room.

In choosing the sick-room in a private house it should be remembered that one with a southern aspect is most suitable. The room should be lofty, bright, and contain little furniture: in cases of infectious disease bed-hangings, carpets, and curtains must be removed (see chapter xxi.). The bed should have a spring mattress. It is a good plan in many cases to have two in the room, one for night and one for day. This adds materially to the patient's comfort. The old feather bed is not suitable for nursing the sick, but in cases where it is in use the nurse must

see that it is made as comfortable as possible, and that the patient is not allowed to sink down into it.

The sick-room should be in the quietest part of the house, so that the invalid may not be troubled with noises, such as traffic and ringing of bells, which are so apt to jar on the patient. The same regularity should be observed as in the ward in the recording of the temperature, pulse and respirations, the actions of the bowels, taking of nourishment, sleep obtained, and any other observations on the progress of the case, for the doctor's perusal. The nurse must be careful to obtain full particulars as to any treatment which the doctor orders to be carried out, and she need never be afraid of asking too many questions which may bear on the nursing and general management of the case. If any alarming symptoms supervene in the doctor's absence, the nurse will give orders for him to be summoned, taking care in so doing not to unduly frighten the household. In cases of emergency she may have to act on her own responsibility. At such times her own good judgment must guide her, and above all things she must appear calm and self-possessed.

All requisites for dressing in surgical cases should be placed in readiness in one part of the room.

The sick-room must be kept sweet and wholesome, and this should be managed with less difficulty than a large ward full of patients.

The nurse will often have to amuse her patient by reading aloud and other occupations; sometimes music may be permissible. When convalescence is established and outdoor exercise can be taken, she will accompany her patient and prevent him unduly fatiguing himself.

It will thus be seen that the private nurse may have to add to her special duties that of companionship. She may even be called upon to act as an escort for her patient either abroad or to the seaside or country. The more valuable will the services of the private nurse be according as she is able to add to her professional duties accomplishments such as music, singing, painting, sketching, and the like. Lastly, she should cultivate the art of reading aloud.

It will be seen then that there is ample scope for the private nurse to add to her *répertoire*, and thus to render her services increasingly valuable.

The district nurse. The district nurse has made rapid strides in the last few years in the estimation of the public. Most towns and indeed villages now employ a nurse, who is generally paid by private subscription. It is unnecessary to enlarge on the sphere of usefulness which is open to the district nurse. She is constantly called upon to put into practice the qualities of sympathy and kindliness to an extent unknown by hospital and private nurses. She must be truly the friend of the poor, the harbinger of cleanliness, comfort, and advice to those with whom she has usually to deal. She must avoid above everything being dictatorial and "standoffish" in her dealings with her patients, who will be quick to resent such a demeanour. She will accomplish her work most thoroughly, and obtain the love and respect of those among whom she works, by recognising in them her brothers and sisters, who, though poor and perhaps also dirty and degraded, are yet human, and entitled to her help and advice.

The district nurse generally works under a local committee, from whom some of the necessaries required by the sick poor may be obtained, such as bed-clothing, sick-room appliances, beef-tea, stimulants, etc. This will materially lighten her labours. She will often meet with squalor and poverty in their worst forms, where nursing seems to be out of the question; but even here a well-made bed, a few hints on diet and the preparation of the invalid's food, combined with a few kindly words, will go far to render the life of such a patient more comfortable. She must do her utmost to work under the doctor, and should on no account undertake any medical treatment on her own responsibility, except in the giving of first aid and in cases of emergency, when she must advise the immediate summoning of the medical man. By thus working with the doctor and limiting herself to her own duties she will be welcomed by all as a valuable aid in the managing of the sick poor in their own homes. On the other hand, by usurping the *rôle* of the doctor she will sooner or later bring discredit on herself and her profession, and lose that respect to which every conscientious and painstaking nurse is entitled.

In her daily work the district nurse must be methodical. She should try to visit acute cases early, and be prepared

to render every assistance in her power. On her arrival she will proceed to make the patient as comfortable as possible by making the bed, and sponging the face and hands, and sometimes also the rest of the body. She will take the temperature, and either report personally to the doctor on his visit, or else leave her observations and report on a piece of paper or a chart. In severe cases she will attend twice a day or oftener, her visits of course depending on the number of patients demanding her attention and the distance she has to travel. Any orders left by the doctor she will carefully carry out, such as the application of poultices and dressings. She will endeavour to instil into the minds of the household the elementary principles of ventilation, the importance of cleanliness, and the strict observance of the orders for the administration of medicines and for the general attendance on the invalid or invalids. She may have to prepare for and assist at operations.

To her nursing qualifications the district nurse must add a knowledge of invalid cookery, as she will often be called upon to give instructions concerning the preparation of the patient's food, and even to undertake its actual preparation herself.

CHAPTER VIII.

DIGESTION AND DIETETICS.

It will be convenient to study together the digestion of the food and the considerations which guide us in the choice and mode of administration of the various articles of diet, both in health and disease. To this latter subject we apply the term dietetics.

Groups of food-substances. Before, however, describing the digestion of the food it will be necessary to enumerate the groups into which we divide food-substances, and to refer to each group in turn.

Proteids. (1) The proteids. In this group are included all those articles of food which we are accustomed to speak of as nitrogenous, because they supply the chief amount of nitrogen required by the body. In addition to nitrogen proteids contain carbon, hydrogen, oxygen, and sulphur. In the body proteids are contained both in the tissues and in the blood and lymph. They are broken up in the body, part being stored up, probably as fat as well as proteid, and part being removed from the body, chiefly as urea and uric acid (see p. 93). As the proteids are the most important constituents of the body, so do they form the most important element in our food. We cannot live without them, and when they are deficient in amount the body loses weight. The food-substances which contain proteids in considerable quantity are the various meats, such as beef, mutton, pork, and veal; poultry and fish; and milk, eggs, and cheese.

Fats. (2.) The fats. In this group we place such articles as suet, butter, and various oils, as olive oil. The fats are an important source of heat and energy to the body, and their absence leads to wasting, even when the other food-substances are supplied in abundance; for although it has been proved beyond doubt that the fat of the body is in part derived

from proteids and from the next group to be considered, namely the carbohydrates, yet there seems to be some special requirement on the part of the body for fat already formed. We consume a varying quantity of fat with our meat, and in addition to this we obtain it from milk and cheese. Butter is a variety of fat. Fat is difficult to digest.

Carbohydrates. (3) Carbohydrates. The name amyloids (Lat. *amylum*, starch) has been given to these substances, which comprise sugar and all starchy foods, such as bread, the cereals, and vegetables. Such articles of food as rice, cornflour, tapioca, sago, and arrowroot are all examples of starchy foods. The carbohydrates supply a large amount of carbon to the body. Their nutritive value is, however, very low; but they are agreeable articles of food, and are on this account useful. When taken in excess, the carbohydrates lead to an accumulation of fat in the body.

Mineral constituents. (4) Mineral constituents. These include various salts and water, and are of great importance to the body. The various meats, and indeed all, or very nearly all, the food-substances, contain mineral constituents.

Accessory articles of diet. (5) Accessory articles of diet. These, which include tea, coffee, cocoa, the condiments, such as mustard and pepper, and alcohol, need not occupy us further at present.

We shall now pass on to study the various digestive processes to which the food-substances are subjected.

Action of the saliva. The first digestive fluid to be encountered is the saliva. This fluid acts only on the carbohydrates, transforming the starch contained in them into a variety of sugar, called maltose, very closely allied to that form of sugar known as grape sugar, which is found in the urine in diabetes mellitus. This action is due to a substance in the saliva known as ptyalin.

Action of the gastric juice. The food is next acted upon by the gastric juice, secreted by glands in the wall of the stomach. The great action of the gastric juice is to convert the proteids into peptones, by which they are more easily absorbed into the blood. This change is brought about by the ferment pepsin, contained in the gastric juice, but it can only take place in the presence of the hydrochloric acid contained in the juice. An acid, then, is essential for the change. Suppose we

were to obtain a sample of gastric juice, and, at the proper temperature, to introduce into it and digest in it a piece of meat. The fibres of the meat would be seen to swell up, dissolve, and finally almost entirely to disappear.

The only other action of the gastric juice to which we need refer is that on milk. The milk is curdled in the stomach by a substance somewhat similar to pepsin, but for this change an acid is not necessary. If a few drops of the preparation known as rennet, which is obtained from the stomach of a calf, be added to milk, and the solution heated to about 103° or 104° F., curdling of the milk will take place, and a clot be formed. This is used to make curds and whey. A substance, called casein, is formed in the milk by the gastric juice, and hence clotting results.

Chyme.

The food, which is now known as the chyme, passes on into the small intestine, and is there subjected to the action of three juices—namely, the bile, the pancreatic juice, and the intestinal juice.

Action of the pancreatic juice.

We shall first of all describe the action of the pancreatic juice on the food. This juice is secreted by the pancreas, and is conveyed by a duct into the duodenum, where it meets the acid chyme. It acts on the proteids, the fats, and the carbohydrates. The proteids are converted into peptones as before; but whereas the gastric juice acts only in the presence of an acid, the pancreatic juice fails to transform the proteids into peptones when an acid is present. The substance contained in the pancreatic juice which brings about this change is called trypsin.

If some meat were exposed to the action of the pancreatic juice under the same conditions of temperature that we indicated when speaking of the gastric juice, we should see that the fibres, instead of becoming swollen, would rather become eroded until digestion gradually became completed.

The pancreatic juice acts on fats by emulsifying them, thereby bringing about a minute division of the fat-globules, and thus allowing the oil to pass through the walls of the intestine. The other action of the juice on fats, by which glycerine is produced, need not occupy us.

Lastly, it acts on the carbohydrates as the saliva does, but more powerfully, the starch being rapidly changed into maltose.

The action of the pancreatic juice on the three groups of food-substances depends on three different substances contained in the juice, one of which we have seen to be called trypsin.

Action of the intestinal juice. The intestinal juice is secreted by glands in the wall of the small intestine. Its action is by no means so rapid and definite as is that of the gastric and pancreatic juices. It is probable, however, that it acts on the food-substances just as does the pancreatic juice, and that it also has the power of curdling milk.

Action of the bile. The bile, which is secreted by the liver and stored in the gall-bladder, is conveyed into the duodenum by the common bile-duct. The reaction of bile is alkaline, and it tends to diminish or remove the acidity of the stomach-contents which have passed into the duodenum. It has no digestive action on proteids. On fats bile acts by emulsifying them, but this is not nearly so well marked as in the case of the pancreatic juice. In addition to its slight emulsifying power, the bile acts as a stimulant to the bowel, increasing its peristaltic action, by which the contents of the bowel are moved onwards. It also plays the part of an antiseptic.

The following table gives the action of the digestive juices on the proteids, fats, and carbohydrates :—

DIGESTIVE JUICE.	PROTEIDS.	FATS.	CARBOHYDRATES.	
SALIVA			Changes starch into maltose.	
GASTRIC JUICE	Changes proteids into peptones.			Curdles milk.
PANCREATIC JUICE	Changes proteids into peptones.	Emulsifies fats and splits them up.	Changes starch into sugar.	
INTESTINAL JUICE	Changes proteids into peptones.	Emulsifies fats and splits them up.	Changes starch into sugar and cane sugar into grape sugar.	
BILE		Emulsifies fats slightly.		

The contents of the intestine are transformed, by the emulsifying action of the digestive fluids to which they are exposed, into a thick whitish fluid, called chyle. This fluid is absorbed into the blood, partly by the capillaries in the walls of the intestine, and partly by the lymphatic vessels of the bowel, which we have already referred to as the lacteals (p. 26). It is true that some of the food is absorbed by the stomach, but by far the greater part is absorbed by the intestine. **Chyle.**

The blood-vessels are responsible for the absorption of the chief part of the peptones, the sugar and salts, and a little of the fat; while the lacteals carry into the blood the principal part of the fat, with a small quantity of peptones.

The undigested part of the food is transformed into the fæces, which move along the intestinal canal, to be discharged from the body.

Having now completed an account of the digestion of the food, the subject of diet in health and disease must be discussed.

Diet in health. The diet in health need not occupy us long. There is no doubt that some of us eat and drink too much, while others eat and drink too little; and a considerable amount of disease may be ascribed, directly or indirectly, to these errors in diet.

It is obvious that a man doing hard manual labour requires a different dietary to his neighbour who is doing no work. To regulate the diet according to the requirements of the individual is often a most difficult task. The quantity and the quality of the food-substances needed, together with the modes of preparation of the same, have to be taken into consideration.

It has been proved by experience that the diet most suitable for the human body is a mixed one. A man cannot live without proteids; and although fats and carbohydrates are not necessary for life, yet their withdrawal, at any rate for any length of time, leads in many cases to failure of digestion, and impaired function of the body generally. For severe labour more food must be taken; especially does this refer to the proteids: on the other hand, when the body is at rest, less food is required. We must remember

that these food-substances are variously combined in our ordinary articles of diet.

The following table is that usually recommended as being best suited for an average daily diet:—

Proteids.	Fats.	Carbohydrates.
$4\frac{1}{2}$ oz.	3 oz.	$14\frac{1}{2}$ oz.

Salts.	Water.
1 oz.	80 to 90 oz.

Before turning to the question of diet in disease it will be advisable to speak of milk, and refer to some of the accessory articles of diet.

Milk. Milk may be looked on as an ideal human food. It contains all the food-substances. Milk consists of little fat-globules surrounded by a covering of casein, one of the two proteids present in milk: these fat-globules are suspended in a watery fluid, which contains the second proteid of milk—namely, albumin. Milk also contains salts and a variety of sugar, termed sugar of milk, or lactose.

Milk, as is well known, is secreted by the mammary glands; those members of the animal kingdom whose females nourish their young with their own milk are called mammals.

Human milk differs in certain points from that of the lower animals, such as the cow, the goat, the ass, and the mare. Human milk contains more water and sugar than does that of the cow. For this reason in weaning infants it is necessary to add to cow's milk a little water and sugar.

The whey of milk contains by itself all the elements required for nourishment; and in cases of weak digestion, where milk cannot be retained, whey is often an admirable substitute. We have already referred to its method of separation from milk by rennet. Milk has an alkaline reaction; but under certain conditions, as in very hot weather, a change is liable to be set up by an organism (bacterium lactis), whereby the milk becomes acid in reaction and sour. This may usually be prevented by strict observance of cleanliness, especially in dairies, and by the addition to the milk of a small quantity of bicarbonate of soda in cases where the change is liable to take place.

The milk secreted by the breasts during the first few

days after confinement is called colostrum. It contains more solid matter than does ordinary milk. It is generally admitted that cow's milk is the best substitute for human milk for the infant.

Value of alcohol as a food. We cannot do more than touch on the question of the value of alcohol as a food in health. It is held, and with much reason, by very many that to a healthy individual alcohol is not only quite unnecessary, but harmful. But probably those are nearest the truth who steer a middle course, and advise the use of alcohol, always in the greatest moderation, under certain conditions.

To those who are engaged in severe labour, both physical and mental, alcohol, in suitable quantity and quality, is often a most valuable food, acting as it does by increasing the appetite, aiding digestion, strengthening the heart, and stimulating the brain. But it has been shown over and over again that alcohol is not a necessary article of diet, and we may take it that the vast majority of people are better without it.

Tea, coffee, and cocoa. Tea, coffee, and cocoa are all valuable articles of diet, and are usually easily digested. They all contain substances which are valuable nerve-stimulants. Tea, especially, by stimulating the heart and nervous system and diminishing muscular fatigue, gives a feeling of tone to the body.

Diet in disease. In speaking of the diet in disease all that can be attempted is to lay down certain principles in reference to some of the commoner diseases which especially call for dieting. When describing these, it will be necessary to refer again to the question of diet.

The regulation of the diet in disease is of the greatest importance, and constitutes sometimes the chief part of the treatment.

Weak digestion. In cases of weak or otherwise impaired digestion it is of the utmost importance that all articles of food at all difficult of digestion should be avoided. Hence it will be usually necessary to forbid many of the meats, mutton being the most easily digestible.

The fats, too, and articles of diet which contain them, such as pastry, will have to be forbidden in most cases. Sugar and starchy food have to be avoided in diabetes mellitus, and in some other diseases the carbohydrates must be diminished in quantity.

Diet in fevers and acute inflammatory disorders.

In fevers and acute inflammatory disorders solid food cannot be administered as a rule, and milk must often form the staple article of diet. In such cases, and indeed in nearly all diseases, the food must be given in less quantity, and consequently more frequently, than in health.

In convalescence from acute disease the ordinary diet must be gradually returned to, fish, eggs, and milk puddings being among the solids usually first ordered, to be followed by white meat, such as rabbit and poultry, before butcher meat is allowed.

Diet in gout.

In gout, which consists of an accumulation in the system of waste products, the proteids must be diminished and supplemented by a more or less vegetable diet. Alcohol, except in the form of spirits well diluted and taken in great moderation, should be abstained from.

Diet in acute Bright's disease.

Another disease where the nitrogenous articles of food may have to be cut off entirely, or almost so, is Bright's disease, particularly in the acute variety. In this disease milk is of inestimable value, and for two reasons. In the first place, it is non-irritating, and throws little work on the diseased kidneys, while at the same time it is highly nourishing. Secondly, it flushes the kidneys, removing from the tubules, where they are diseased, the inflammatory products.

Diet in aneurism.

The only other disease we shall mention in this connection is that known as aneurism, which we have seen to consist in a giving way of the walls of an artery to a greater or less extent, so that a swelling or dilatation appears in the course of the vessel, which is liable to burst sooner or later. In such cases it is important to give food in very small quantities. Of course under such circumstances the patient is at complete rest, and so very much less food is required than would otherwise be the case.

An example of an aneurism diet is that advised by Tufnell:—

Breakfast:	2 oz. white bread with butter. 2 oz. of cocoa and milk.
Dinner:	3 oz. boiled meat. 3 oz. potatoes or bread. 4 oz. of water or light claret.
Supper:	2 oz. bread and butter. 2 oz. milk or tea.

Such a diet as this has to be attained to gradually. The force of the circulation is much decreased by a low diet such as the above, and this acts beneficially on the aneurism.

In conclusion, the subject of artificial digestion must be considered.

Artificial digestion. In certain cases where the digestive powers are at a very low ebb it may be necessary to give food artificially digested.

The pancreatic fluid gives more satisfactory results than the gastric juice in preparing artificially digested food, inasmuch as its action on the food-substances is more widespread. Not only this, but food thus prepared is more palatable when the pancreatic juice is used.

The pancreatic fluid is usually obtained from the pig; but other animals, such as the sheep, ox, or calf, may be utilised to procure it.

The pancreatic juice prepared by Mr. Benger is commonly used.[1]

To peptonise milk add to one pint a tablespoonful of liquor pancreaticus and fifteen grains of bicarbonate of soda. Heat to 100° F., and allow it to remain for two hours. Then boil for a few minutes. The milk should be diluted with a little water before adding the liquor pancreaticus, to obviate the tendency to curdling.

Gruel, beef-tea, soups, and jellies may be peptonised on similar lines to the above: two hours should be allowed for digestion to take place, and then the process is arrested by boiling.

Better results will be obtained by preparing the various articles of food shortly before use, rather than by buying them already peptonised.

Nutrient enemata. Nutrient enemata are peptonised in a similar manner; one or two teaspoonfuls of the liquor pancreaticus will usually suffice. Nutrient enemata, peptonised or not, are most useful in cases where the stomach is irritable and intolerant of any food, and under other circumstances, such as extreme exhaustion. Not more than six ounces

[1] Fairchild's digestive preparations are also much used now, especially that known as "Zymine," which is a peptonising powder prepared from the pancreas. It is put up in small tubes,

should be injected at a time, or the bowel will not retain it.

Nutrient enemata usually consist of milk—often peptonised—beef-tea, and eggs, with or without a stimulant, as may be required. When the rectum is irritable, a few drops of laudanum may be added to the enema before administration, to promote its retention.

CHAPTER IX.

THE ACTION AND ADMINISTRATION OF DRUGS.

IT is useful for the nurse to have an elementary knowledge of the commoner drugs in use, both as regards their mode of action and method of administration. The authoritative work on the drugs recognised by this country is called the British Pharmacopœia (B.P.). Each country has its own, which differs from ours in the number and variety of drugs contained therein. Our own Pharmacopœia contains as many as eight hundred and fifty substances, many of which are, however, but little used. Again, there are many valuable remedies which are not at present contained in our Pharmacopœia; these are called "unofficial," to distinguish them from the drugs contained in the B.P., which are called "official."

British Pharmacopœia.

By means of a standard work such as this drugs are prepared in a special way for administration, and these preparations are made and guaranteed to be of a uniform strength. This is of great importance when prescribing poisonous drugs, as arsenic and strychnine.

The doctor, then, must be conversant with the preparations and strength of the drugs in the Pharmacopœia in order to prescribe.[1] This is of course unnecessary for the nurse, but there are a few elementary points with which she should be acquainted.

Drugs are derived from the animal, vegetable, and mineral worlds. Certain weights and measures are used in dispensing.

Source of drugs.

The weights are :—

Weights used in dispensing drugs.

The grain.	Symbol	gr.	The ounce.	Symbol	oz. or ℥
,, drachm	,,	dr. or ʒ	,, pound	,,	lb.

[1] A new edition of the Pharmacopœia was compiled last year (1898), and is now in circulation.

A drachm contains sixty grains; an ounce, between seven and eight drachms; and the pound, sixteen ounces.

The measures are:—

Measures used in dispensing drugs.

The	minim	Symbol	♏
„	drachm (fluid)	„	ʒ (fl.)
„	ounce „	„	℥ „
„	pint	„	O
„	gallon	„	C

A fluid drachm contains sixty minims; a fluid ounce, eight drachms. The pint contains twenty ounces, and the gallon eight pints.

In measuring medicines it is a common and convenient practice to use spoons, which are generally moderately accurate, but where possible a graduated glass should be used.

A	teaspoonful	= a fluid drachm (ʒj)
„	dessertspoonful	= 2 fluid drachms (ʒij)
„	tablespoonful	= half a fluid ounce (℥ss)

The prescription.

We shall now say a few words about the prescription. In prescribing we have a definite object in view, and we use that drug or combination of drugs which we believe to be best suited to accomplish that object.

Form of administration of drugs.

We have also to decide in what way the drug or remedy is to be given—whether, for example, in a mixture, a pill, a powder, or a lozenge. This question is one largely of convenience, and no rule can be laid down. Nauseous drugs are often given in pill form. Powders are extremely useful in young children, to whom we rarely administer pills.

Dose of drugs in children.

The dose of drugs cannot be entered into here. Doses have to be learnt and due allowance made for children. One word of caution may be given, however. Children, especially infants, take opium badly, and a nurse should be especially careful in measuring a medicine for a child containing this drug. A useful rule to regulate a dose for a child is to divide the age next birthday by twenty-four; so that one six years old would require about a quarter of the adult dose.

Explanation of a prescription.

To write and read a prescription an elementary knowledge of Latin is necessary. Let us take one and explain it:—

℞ (Recipe = Take)—

Magnesii Sulphatis, drachmas sex (ʒvj),
Acidi Sulphurici Diluti, drachmas duo (ʒij),
Aquæ Menthæ Piperitæ ad uncias sex (℥vj).
F. M. (Fiat Mistura).

Signetur: ℥ss. 4 hrs. (half an ounce every four hours).

Translated into English this would be:—

Take six drachms of Sulphate of Magnesia, (take) two drachms of Diluted Sulphuric Acid, (take) of Peppermint Water up to six ounces. Let the mixture be made. Let it be directed: One tablespoonful every four hours.

One more example will suffice:—

℞.

Pulvis Ipecacuanhæ Compositæ, drachman unam (ʒj). Divide in pulveres sex.

Signetur: Unus sumendum hora decubitus.

Take of the Compound Powder of Ipecacuanha one drachm. Divide into six powders. Let it be directed: One to be taken at bed-time (the hour of lying down).

We see that there would be ten grains of this preparation (one-sixth of sixty grains) in each powder.

Abbreviations in common use in prescriptions.

We shall now give a few of the abbreviations which are in constant use in prescriptions. These the nurse will do well to learn:—

p. r. n. (pro re nata) } As required.
u. o. s. (ut opus sit) }
hor. decub. (hora decubitus), At bed-time.
dol. urg. (dolore urgüente), When the pain is severe.
rep. (repetatur), Let it be repeated.
sig. (signetur), Let it be directed.
q. s. (quantum sufficit), A sufficiency.
b. i. d. (bis in die), Twice a day.
t. i. d. (ter in die), Three times a day.
ex aq. (ex aqua), In water.
ss. or *ſs.* (semi or semis), Half.
āā. (ana), Of each.
Haust. (Haustus), Draught.
Mist. (Mistura), Mixture.
Collyr. (Collyrium), Eye-wash.

Collun. (Collunarium), Nasal douche.
Ung. (Unguentum), Ointment.
Lot. (Lotis), Lotion.
Lin. (Linimentum), Liniment.
Pil. (Pillula), Pill.
Supp. (Suppositorium), Suppository.
Pulv. (Pulvis), Powder.
Garg. (Gargarisma), Gargle.
Stat. (Statim), Immediately.
Cras, To-morrow.
Noct. (Nocte), At night.
Man. (Mane), In the morning.
Ante cib. (Ante cibum), Before food.
Post cib. (Post cibum), After food.

Administration of medicines. Before referring more especially to the drugs themselves, a few remarks about the administration of medicines will not be out of place.

The medicine-bottle should have the directions carefully printed or written on a label, with the patient's name. The nurse should administer medicines at fixed intervals and with regularity; but, unless ordered to do so, she should not wake up a patient for a dose. The mixture must be measured in a graduated glass. It is as well to keep bottles not in actual use in a cupboard set apart for the purpose. Unfortunately mistakes sometimes occur either by giving patients their medicine out of the wrong bottle or an overdose. Such mistakes can always be avoided by the exercise of accuracy and ordinary care. Lotions and liniments should be duly labelled "Poison," and kept in special bottles.

The head nurse in a ward should keep the key of the "Poison Cupboard," and must be responsible for its safe custody and for the locking up of the cupboard.

A nurse must ascertain whether or no an alteration has been made by the doctor in the medicine, and any such alteration must be carried out without delay. If the nurse observes any bad effect from the medicine administered, such as vomiting, nausea, diarrhœa, or headache, she should at once communicate any such observation to the doctor.

Idiosyncrasy to certain drugs. Certain drugs are apt to give rise to unpleasant symptoms in some people, even where the dose may be small. Such

people are spoken of as showing an idiosyncrasy to the drug in question. Quinine sometimes causes intolerable headache, with ringing in the ears; another example is seen in iodide of potassium and other iodine compounds, where symptoms resembling a severe cold in the head and sometimes a peculiar rash on the body may result.

Drugs may be administered by the mouth, the rectum, or, when a rapid action is desired, they may be injected under the skin. Again, they may be applied locally to the skin, the eye, the nose, or the throat. Drugs are administered to the rectum in a solid form—the suppository; or in a fluid form—the enema. The latter may be given simply to act mechanically by clearing out the lower bowel, or to act on the mucous membrane of the bowel—for instance, in some cases of diarrhœa, when an opium-and-starch enema may check the increased secretion.

The bulk of the enema depends on the object with which it is given: when given with a view to absorption, from four to six ounces should be injected. Most drugs are absorbed through the stomach and intestines, whence they reach the tissues, and act upon them in their own special way. But they are also absorbed through the skin and the rectum.

Classification of drugs. The drugs we use are conveniently divided into certain classes, according to the prominent action produced by them. Some, however, may be included in more than one class. We shall now briefly refer to a few of these classes.

Emetics. (1) Emetics. These produce vomiting, and are employed when we wish to empty the stomach through the mouth in cases of poisoning, over-distension, and acute indigestion, or sometimes to promote the discharge of mucus from the bronchial tubes in young children, which the act of vomiting encourages. Examples of such drugs are mustard, ipecacuanha, sulphate of zinc, carbonate of ammonia (smelling-salts), and salt-and-water.

Purgatives. (2) Purgatives. These substances increase the quantity and the frequency of the discharges from the bowels. They may be mild (sulphur, compound liquorice powder, castor oil) or strong (colocynth, saline purgatives). Substances which specially increase the quantity of bile are mercury in the form of blue-pill or calomel, and rhubarb.

Expectorants. (3) Expectorants. Such drugs aid the removal of mucus from the bronchial tubes; hence their value in so many

chest affections. Ipecacuanha and carbonate of ammonia both act as expectorants in doses which would be too small to produce vomiting. Other examples are the compound tincture of camphor (paregoric) and squills.

Diaphoretics. (4) Certain drugs, by stimulating the glands in the skin, increase the quantity of perspiration. Many of the salts of potash and ammonia belong to this class. The best example, however, is a plant which comes from Brazil, called jaborandi, from which pilocarpine is obtained. Such a drug, given by the mouth or injected under the skin, causes an extremely profuse flow of sweat, which simply pours off the body. These substances are called diaphoretics.

Diuretics. (5) Many drugs—known as diuretics—increase the flow of urine. Examples are some of the potash salts and digitalis.

Tonics. (6) Tonics are drugs which improve the general health of the body. This is a large group, and includes drugs which act specially on the stomach, the heart, and the brain respectively. As examples we may mention nux vomica and the substance obtained from the seeds of this plant, which we all know as strychnine; arsenic; and quinine.

Sedatives. (7) Sedatives. These diminish the activity of the tissues. Here again we have a group of drugs which may act specially on the stomach, the heart, and the brain. Opium, bromide of potash, aconite, chloral, and hyoscyamus belong to this group.

Anæsthetics. (8) Anæsthetics are drugs which temporarily destroy sensibility. These we divide into general and local, according as the action is generalised over the whole body or confined to a given area. Ether and chloroform are general anæsthetics; cocaine has only a local action.

Mydriatics. (9) Mydriatics, when applied to the eye, cause dilatation (increase of size) of the pupil. To this class belong atropine, the substance obtained from the root of the belladonna plant (deadly nightshade), and cocaine.

Myotics. (10) Substances which contract (diminish size of) the pupil are called myotics. This group includes opium and eserine: the latter is derived from a poisonous bean obtained from Western Africa (Calabar).

We have now mentioned some of the more important classes into which we divide drugs, as far as their action

on the body is concerned. The class known as antiseptics will be referred to later on.

Specific drugs. (11) Some drugs have been found to exert a markedly beneficial influence on the course of certain diseases, and have on that account been spoken of as specific drugs for their respective affections. The best examples are found in the specific remedies for syphilis—namely, mercury in the earlier manifestations, and iodide of potash, with or without mercury, in the later stages. Other examples are colchicum in gout, often combined with the alkalies (soda and potash) or magnesia, salicylate of soda in rheumatic fever, and quinine in malaria.

We shall have constantly to refer to drugs when indicating the treatment of the diseases described in the third part of this work. When mentioning drugs, it will be necessary for us to understand how they produce their effect; this will be explained as far as is possible, so that the nurse will generally be able to understand, at any rate in a slight measure, the reason why a particular drug or combination of drugs is administered in a particular disease.

CHAPTER X.

THE URINE IN HEALTH AND DISEASE.

ALTHOUGH the examination of the urine is part of the doctor's work, yet the nurse should be able to undertake it, at any rate in part, and it is well for her to be acquainted with the commoner tests employed.

There are certain points to be observed in the obtaining of a specimen. It should be fresh, and, when possible, should be taken from the mixed urine of twenty-four hours. The glass should be thoroughly clean. A conical glass is the most convenient, as it allows of any sediment being easily removed from the bottom of the vessel for examination. The glass should be covered with a piece of paper, on which is written the patient's name.

The urine in health. We shall describe the urine under the following heads, both in health and in diseased conditions:—

Quantity. (1) Quantity. This varies with the quantity of liquid taken; also with the temperature; for when the skin acts freely, as it does in warm weather, less water leaves the body by the kidneys, and *vice versâ*. Less urine is usually secreted during sleep. The average quantity passed in the twenty-four hours is fifty ounces, but the limits in health may be said to be from thirty-five to sixty ounces.

Colour. (2) Colour. This is due to pigments in the urine. It varies from pale yellow to darkish brown. As a rule the greater the amount of urine passed the paler is the colour.

Transparency. (3) Transparency. Healthy urine is nearly always clear when passed, but soon a cloud of mucus forms, which causes a slight turbidity to appear.

Specific gravity. (4) Specific gravity. This we obtain by an instrument called the urinometer, which has a graduated stem. It is placed in the urine, in which it floats, and care must be taken not to allow it to touch the sides of the glass. The

specific gravity depends on the quantity of solid matter in solution, and varies from 1015, or even less, to 1025 in health. The average may be taken to be 1020.

(5) Reaction. Healthy urine has usually an acid reaction. The reaction is determined by litmus-paper, red and blue. The blue paper is turned red by acid urine, and the red paper blue by alkaline urine. When neither paper is altered, the urine is said to be neutral. **Reaction.**

(6) Odour. Healthy urine has a slight characteristic odour. **Odour.**

(7) Deposit. There is seldom any deposit in healthy urine, although a brick-red sediment, signifying the presence of urates, sometimes occurs in cold weather, especially after prolonged exercise, which cannot then be considered abnormal. We have already referred to the cloud of mucus; this may come to form a slight deposit. **Deposit.**

(8) Constituents of the urine. We shall only mention the more important of these. The urine contains waste nitrogenous and other solid matters dissolved in it. **Constituents of the urine.**

The most important constituent, which represents the waste nitrogenous material, is called urea. It is very soluble. Urea is found in the blood and in nearly every tissue of the body, from which it is extracted by the kidneys. The more nitrogenous, that is to say animal, food we eat, the more urea do the kidneys remove from the body up to a certain point. But even when no nitrogenous food is taken, some urea is excreted in the urine: this shows us that urea is derived from the waste that goes on in the tissues as well as from the food. **Urea.**

A substance, called uric acid, occurs also in the urine, but in far smaller quantity than urea, in combination with potash, soda, and ammonia. **Uric acid.**

We have mentioned the pigments in the urine, which give to it its colour.

The chief inorganic constituents or substances derived from the mineral world are water and some of the salts of potash, soda, and ammonia; these salts are the chlorides, sulphates, and phosphates. **Inorganic constituents.**

Having now described the healthy urine, we shall now pass on to the urine in disease, pursuing the same order of description. **The urine in disease.**

(1) Quantity. When we have reason to believe that too **Quantity.**

much or too little urine is being passed, it is necessary to measure the quantity passed in twenty-four hours. The quantity is increased in the two forms of diabetes—the one form (diabetes insipidus) being characterised merely by the passage of a large quanity of urine, and the other (diabetes mellitus) by not only an increase in the amount of urine, but the presence in it of more or less sugar. The quantity is also increased in some forms of chronic kidney disease. Diuretic drugs, by their special action, increase the quantity of urine. The quantity is diminished, on the other hand, in all cases of fever, in acute inflammation of the kidneys, and in cases characterised by profuse diarrhœa or perspiration, where most of the water leaves the body by the bowels and skin respectively. In cases of great prostration and collapse, such as occur in cholera and other severe diseases, the kidneys may fail to secrete any urine (suppression of urine). This might also occur in extensive disease of both kidneys.

Colour. (2) Colour. The urine secreted in cases of diabetes and hysteria is usually very pale in colour. In fevers, on the other hand, where the urine is scanty, it is apt to be high-coloured. The colour is deepened in jaundice, owing to the bile which it contains. The colour may be affected by drugs: for example, carbolic acid imparts to it a dark olive-green tint.

Transparency. (3) Transparency. This may be impaired or lost when the urine contains mucus, phosphates, urates, blood, pus, or albumin. Oxalate of lime, too, causes a cloud in the upper part of the urine glass. Turbidity of the urine may therefore be present in a vast number of diseases.

Specific gravity. (4) Specific gravity. Before drawing any conclusions from the specific gravity of the urine we should ascertain the quantity passed. In pale, watery urine the specific gravity is generally low; when it is high, we are led to suspect the presence of sugar. In concentrated, high-coloured urine the specific gravity is high, from the large quantity of solids present.

Reaction. (5) Reaction. The reaction of urine may be altered after it is passed by fermentation, which may be acid or alkaline, more commonly the latter. Alkaline urine, which is usually very offensive, is common in inflammation of the bladder, and often results from the passage of a dirty catheter.

(6) Odour. Alkaline urine has very often a smell of ammonia, which is due to alkaline fermentation, whereby the urea is transformed into carbonate of ammonia. The urine under such conditions is termed ammoniacal. In diabetes mellitus the sugar in the urine gives to it a sweet smell, which has been compared to that of new-mown hay. Certain drugs give to the urine a characteristic odour. **Odour.**

(7) Deposit. The commonest deposits in urine are those due to phosphates, urates, and mucus. **Deposit.**

Phosphates occur in alkaline urine, and usually indicate insufficient exercise with sedentary occupation, a febrile condition, or disease of the nervous system.

Urates are only deposited on cooling of the urine: when passed the urine is clear, but it soon becomes turbid, and a brick-red deposit appears. They are distinguished from phosphates by their disappearance on the application of heat. Gastric derangements, great exertion, and fever are responsible for their deposit. They are of little consequence unless they persist. They are sometimes called lithates (Gk. *lithos*, a stone).

Mucus should only be present in slight amount in healthy urine. It is often derived from the vagina in the female. It is largely increased in quantity in inflammation of the bladder (cystitis), when it is often mixed with pus (muco-pus).

Other deposits which may be found are those due to pus, blood, and, more rarely, other substances.

(8) Abnormal constituents of the urine. Under this heading will be included the commoner of those bodies which may occur in the urine in disease. The first of these requiring mention is albumin. **Abnormal constituents of the urine.**

Albumin may occasionally be present in health; but in nearly every instance, at any rate where it persists, it indicates a diseased condition. Its presence in the urine gives rise to the term albuminuria. It most commonly occurs in the urine in disease of the heart and kidneys. In many fevers, such as scarlet fever and diphtheria, albuminuria is often present, but only in slight amount. When blood or pus is present in the urine, albumin, in greater or less amount, is necessarily present, as it is derived from these substances. **Albumin.**

The urine, if examined microscopically in a case of kidney disease, will often be found to contain tube-casts, **Tube-casts.**

which may be regarded as moulds, more or less complete, that have been washed away from the walls of the inflamed tubes by the urine. These tube-casts are sometimes the only positive evidence of kidney disease.

Sugar. We have already referred to the presence of sugar in the urine as indicative of diabetes mellitus. The form of sugar is not, however, the cane sugar to which we are accustomed, but another variety known as grape sugar, or glucose.

Blood. Blood in the urine, which gives to it a peculiar smoky appearance, may come from any part of the urinary apparatus. When mixed uniformly with the urine, it may be regarded as being derived from the kidneys. It is not uncommonly present in acute inflammation of the kidneys (acute nephritis or acute Bright's disease).

Bile. The presence of bile in the urine gives to it a yellowish-green appearance. On shaking the urine becomes frothy. It is usually present in cases of jaundice.

The examination of a specimen of urine. It will now be necessary to point out the methods to be employed in the examination of a specimen of urine. This we can only do briefly. After having noted the quantity, colour, transparency, specific gravity, reaction, odour, and the presence or absence of a deposit, we proceed to test the urine.

Application of heat. Taking a test-tube and filling it to the depth of about an inch, we apply heat. If there is a deposit which clears up, we have to do with urates. If, on heating, a cloud (precipitate) appear, we have to do with either (1) phosphates or (2) albumin.

Addition of nitric acid. Now add a drop of nitric acid. If the cloud disappear, we know that it is due to phosphates; if it still remain, we have to do with albumin.

Cold nitric acid test for albumin. To make sure albumin is present take a clean test-tube, and pour into it a small quantity of nitric acid (to the depth of half an inch). Now slant the tube and pour down very gently a few drops of the urine. A white ring appears where the urine joins the acid, if albumin is present. This is called the cold nitric acid test, and is a very reliable one.

Tests for sugar. There are many tests for sugar in the urine. We need only mention two—one to determine its presence, and one to ascertain its amount. The former consists in the use of a fluid termed Fehling's solution. It is of a deep blue colour. A small quantity is first boiled in a test-tube

to make sure of its purity, as it is liable to decompose after keeping for some time. On boiling it should not lose its colour. Now we add to it a little of the suspected urine, and boil the mixture, when, if sugar be present, the solution changes colour, becoming yellowish, and finally red. This is brought about by the copper in the Fehling's solution being acted upon by the sugar.

To determine the quantity of sugar in the urine we make use of the fermentation test. A half-pint bottle is filled half full with the urine, and into it is introduced a small piece of dry German yeast. The bottle is then corked, a groove having first been made in the cork to allow of the escape of the gas which is formed. Another bottle of similar capacity is filled with the urine and corked tightly. The two bottles are then placed, side by side, in a warm place, and left for twenty-four hours. At the end of that time the fermentation process is complete. The specific gravity of both samples is now taken, that of the unfermented urine being regarded as the standard. The fermented urine will be found to have lost some degrees of specific gravity, according to the amount of sugar present. The sugar, which has been acted upon by the yeast, has been converted into alcohol and carbonic acid gas, the latter of which has escaped through the groove in the cork. It has been found that every degree of specific gravity lost represents one grain of sugar in every ounce of urine. To ascertain, then, the amount of sugar passed in the twenty-four hours we have only to find out the quantity of urine passed in that time. A loss of fifteen degrees of specific gravity would give us a total of twelve hundred grains of sugar where eighty ounces of urine were passed in the twenty-four hours (80×15).

Test for bile-pigment. To test for the pigment of the bile pour a little urine on to a plate, and, dipping a glass rod into some nitric acid, apply it to the urine, when, at the point of contact, a play of colours is obtained, yellow, violet, blue, and green rings being produced.

Test for blood. To test for blood add a drop of tincture of guaiacum to a little urine in a test-tube, and then a little ozonic ether, when, on shaking up, a blue colour appears.

Test for pus. To test for pus add a little liquor potassæ to the sediment, when, if pus be present, it becomes thick and

ropy. Mucus may be distinguished from pus by its becoming thin on the addition of liquor potassæ.

It is only necessary to test for sugar, bile, blood, pus, and other rarer bodies where, from the previous examination of the urine, their presence is suspected; but albumin should in all cases be tested for.

The following table, giving the more important characters of the urine in some of the commoner diseases, may be found useful:—

	NAME OF DISEASE.	CONDITION OF URINE.
I.	GASTRIC CATARRH.	Quantity normal, high coloured; sp. gr. often raised; acid. Urates, oxalates, or phosphates may be deposited.
II.	JAUNDICE.	Urine greenish brown in colour, frothy; acid reaction; contains bile. Quantity and sp. gr. usually normal.
III.	HEART AND LUNG DISEASE.	Urine often diminished, dark in colour, acid; high sp. gr. Urates deposited; albumin often present.
IV.	FEVERS, GENERAL AND SPECIAL.	Quantity nearly always diminished, high coloured, usually acid; high sp. gr.; turbid; urates. May be albumin, blood, and tube-casts.
V.	DIABETES MELLITUS.	Quantity increased, pale, usually acid, sweet odour; high sp. gr. Sugar in greater or less quantity.
VI.	ACUTE NEPHRITIS.	Quantity diminished. Urine may be suppressed. Sp. gr. at first raised, then lowered. Albumin; sometimes blood, tube-casts; sometimes urates.
VII.	CHRONIC NEPHRITIS.	Urine increased in quantity, pale; sp. gr. low. Albumin in small amount, or absent; no blood; a few tube-casts.
VIII.	CHRONIC CYSTITIS.	Quantity not usually altered, turbid, often alkaline and offensive. Mucus and pus (muco-pus) often present.
IX.	ACUTE GOUT.	Quantity usually diminished, high coloured; sp. gr. raised. Abundant deposit of urates.

CHAPTER XI.

INFLAMMATION AND ITS RESULTS.

THE subject of inflammation and its results is a very wide one. All that will be necessary for our purpose, however, will be to give a short description of the inflammatory process with its results, and to point out the symptoms and management of these conditions.

Definition of inflammation. We must in the first place enquire what is meant by inflammation. Many definitions have been given, but perhaps the best one is that which looks upon the process as a succession of changes which occur in a living tissue as a result of irritation from any cause, provided that such irritation does not at once cause death of the tissue. It is obvious from this definition that we may have all degrees of intensity of inflammation, varying from the slightest changes to ultimate death of the tissue involved.

Causes of inflammation. The causes of inflammation are numerous. They may best be regarded as exciting and predisposing. Exciting causes include all those which may operate on the tissues, either from within the body through the blood, or outside the body. As examples may be mentioned the various organisms or germs, which account for most cases of inflammation; physical agents, such as heat and cold; and mechanical agents, such as pressure, violence, and friction.

These exciting causes are often supplemented by the predisposing causes, which render the tissues more liable to be affected than they would otherwise be, by lowering their powers of resistance. These include such influences as old age, heredity, various diseases and injuries, and interference with the blood-supply of the limb. A blow, for example, which would set up inflammation or even

mortification in an old man, might in a youth cause little or no result.

The inflammatory process: its stages. The inflammatory process presents certain well-defined stages, which may be well seen and studied microscopically in such a structure as the web of a frog's foot, which has from one cause or another been excited to inflammation.

By the laws of physics the blood-stream is more rapid in the middle than at the sides of the blood-vessels, on account of the friction of the walls of the vessels which it has to overcome. The heavier red corpuscles travel in the more rapid central part of the stream, while the white corpuscles (leucocytes) pass along the margins of the current.

First stage, hyperæmia. We shall first study the changes in the blood-vessels. The first stage is made up of two phenomena: firstly, an increase in the calibre of the vessels; and, secondly, an increase in the rate of the blood-current. These constitute the condition termed hyperæmia. This stage is soon followed by a slowing of the stream, and as this gradually comes about the white corpuscles begin to lag behind and stick to the walls of the vessels. Then comes the next stage, which is marked by the emigration of leucocytes, which insinuate themselves through the walls of the vessels into the tissues outside. The gradual slowing of the stream continues until a further stage is reached, when the blood-current stops altogether (stasis). Some of the fluid part of the blood passes out through the walls of the vessels with the corpuscles. It should be noted that the red corpuscles tend to pass into the tissues as well as the white, but the former event constitutes a secondary part of the process.

Second stage, slowing of the blood-stream.

Third stage, emigration of the leucocytes.

Arrest of the blood-current.

Multiplication of the tissue-elements. While these changes are going on in the blood-vessels the elements of the inflamed tissue multiply, and there is a large collection of cells, partly made up of the white corpuscles, which have left the vessels.

Results of inflammation. Now, if the inflammation has not been very severe, the process may subside and the tissues return to their former condition. The blood-flow is gradually re-established; the leucocytes return in part to the vessels, and are in part absorbed. But, instead of this, the inflammation may go on to suppuration. These masses of cells die, and a collection of pus results, the liquid part of the pus being represented by the exuded serum, which contains the dead corpuscles and cells. This collection of pus we speak of

Suppuration.

as an abscess. Supposing the changes which constitute suppuration occur on the surface of the body, then we speak of the process as ulceration. An abscess may communicate with the surface of the body by a narrow, more or less tortuous channel, to which we apply the term sinus. When, as a result of severe inflammation or from other causes, a portion of the body dies in mass, the condition is known as gangrene.

Abscess formation. **Ulceration.** **Sinus.** **Gangrene.**

Briefly, then, the inflammatory process, whenever it occurs, may terminate in recovery of the part or in suppuration, which takes the form either of an abscess or an ulcer, according as it occurs in the tissues or on the surface of the body, or in gangrene.

Symptoms of inflammation, local and general.

There are four cardinal signs of inflammation, which, however, are not all necessarily present in every case. If we were to examine, for example, an acutely inflamed knee, it would be seen to be red and swollen; and, on applying the hand to it and comparing it with its fellow, it would be felt to be hot. Probably pain would also be complained of. We have, then, the four symptoms, redness, swelling, heat, and pain, which characterise inflammation. In addition to these there may be various general symptoms, such as fever, headache, and constipation. If the inflammation be still more severe, delirium, collapse, and even death may result.

Varieties of inflammation.

Inflammation may be acute or chronic; and acute inflammation may be simple, such as might result from a blow or other mechanical cause; or it may be complicated by the introduction of germs, which may multiply in the system and produce a fatal result.

Symptoms of suppuration. **Acute abscess.**

The symptoms of suppuration vary according as the abscess is acute or chronic. In an acute abscess, in addition to the symptoms already mentioned, there are often added a throbbing sensation and shivering. Over the inflamed area an elastic boggy swelling will generally be detected, which, if not opened, will burst by "pointing." If the abscess be deep down in the tissues, the presence of pus may be difficult to ascertain, and an exploratory puncture may be required to establish a diagnosis. If the abscess be chronic, when it may be considered in the vast majority of cases to owe its origin to the organism of consumption (the tubercle bacillus), the symptoms are

Chronic abscess.

not uncommonly very vague and ill defined. The most important signs are the characteristic temperature, to which we shall refer when speaking of hectic fever (see p. 128), sweating, shivering, and sometimes a boggy swelling, which, when able to be detected, is sufficient evidence to warrant a diagnosis.

Fluctuation. If the fingers of one hand be placed on an abscess, while the fingers of the other hand are made to gently manipulate the swelling, a wave will be transmitted to the fingers of the hand at rest. Such a wave is known as fluctuation, and may be elicited in most fluid swellings. This may easily be practised on a bladder nearly filled with water. It is sometimes easy to be deceived, however, into believing fluctuation to be present when it is not, especially if we have to do with a soft solid swelling.

Ulcers. The diagnosis of an ulcer is of course self-evident. The type of ulcer with which the different varieties are compared is the ordinary healthy healing sore (healing ulcer), which has healthy surroundings and smooth edges. The discharge is sweet, and may consist simply of serum.

Varieties. A common type of ulcer is the callous, which is so commonly seen on the leg among the poor, in which the edges are hard and raised, the surrounding skin discoloured and unhealthy, and the discharge offensive. Ulcers may be constitutional in origin, such as the tubercular and syphilitic.

The commoner varieties of ulcer and their management will be seen in the table on p. 110.

Gangrene: its symptoms and varieties. When mortification (gangrene) occurs in a previously inflamed tissue, we first of all find a fall in the temperature of the affected part, which, instead of being acutely tender and painful, becomes gradually insensitive. Putrefaction causes gases to be formed, which produce a crackling when the part is handled. The colour changes to a greyish green, and finally becomes almost or quite black.

Dry and moist gangrene. Gangrene may be moist or quite dry; the former occurs when the part is full of blood, and the latter when there is little or no blood in the tissue when it dies. In this case the part simply shrivels up and eventually drops off. Moist gangrene is a much more serious condition, and gives rise to severe symptoms, especially when a vital part, such as the bowel, becomes gangrenous, as not uncommonly occurs in the case of a strangulated hernia.

We must now consider the management of inflammation and its results. **Management of inflammation.**

Included in the treatment of any disease or abnormal process arising within the body are the two factors prevention and cure. The former we are accustomed to speak of as prophylaxis. The prophylatic treatment of inflammation we shall have to consider when speaking of wounds and their management. We shall at present confine ourselves to curative treatment.

The principles which must guide us here are the removal of the cause, when this is possible, and the provision of rest for the affected part. For example, when we have to deal with an inflamed eye, we supply rest to it by covering it up and shutting out the light.

The remedies we apply for the cure of inflammation are both general and local.

General treatment includes that by drugs and diet. **General treatment.**

The drugs we make use of are very numerous, according to the special object we have in view. Occasionally depressing drugs are given, in the case of strong full-blooded subjects with a bounding pulse. Examples of such remedies are aconite, tartar emetic, and the various potash salts; also strong purgatives, such as Epsom salts and jalap. **Drugs.**

The operation of bleeding, which used to be practised so much by our ancestors, has now a very limited application, but it is of undoubted value in carefully selected cases. One of the large veins in the neighbourhood of the elbow-joint is the site selected for this procedure.

Depressing remedies are never used in the case of feeble persons with weak pulse.

Drugs acting on the skin, kidneys, and bowels all have their proper sphere in the treatment of inflammation. Of great value is the class of drugs known as sedatives, especially opium and its active ingredient morphia. Opium acts by relieving pain and supplying sleep. Other sedatives are bromide of potash, chloral, and hyoscyamus (henbane).

Drugs which act primarily by lowering the temperature (antipyretics) may be required. Examples are quinine and phenazone (antipyrin).

There are some drugs which we prescribe on account of their special action in certain diseases. The best examples of these are iodide of potash, colchicum, salicylate

of soda and quinine, which we administer in most cases of syphilis, gout, rheumatic fever, and malaria respectively. Stimulants are often required, and may have to be given in large quantity. They are of course given only by the doctor's orders, except in cases of the greatest emergency. Brandy is the most suitable form of alcohol in severe cases. It is commonly given as the brandy-and-egg mixture. Where a rapid action is required champagne is often prescribed. During convalescence the malt liquors and certain wines, such as Burgundy, claret, and port, are most suitable.

Diet. The diet is usually fluid, consisting chiefly or entirely of milk, beef-tea, mutton-broth, the various meat juices and extracts, eggs, custards, and the like. Cooling drinks, such as home-made lemonade, barley-water, and toast-and-water, are grateful to the patient.

Local treatment. The most important local remedies in inflammation are heat and cold; the latter is more especially valuable in the earlier stages of inflammation, its application being almost entirely limited to this period.

Heat. Heat we usually apply moist; it acts by relieving tension, and, when suppuration is imminent, it favours its occurrence. It is usually soothing and comforting to the patient. We make use of the old-fashioned and very useful poultice, also the fomentation.

A word about poultices. They must be made carefully, and should not be heavy. The nurse will soon learn how to make a good and neat poultice (see Appendix). The us of poultices demands much attention on the part of the nurse, otherwise they are apt to be a source of danger. Sometimes sedatives may be combined with heat with much benefit; a favourite plan is to sprinkle lead-and-opium lotion on flannels wrung out of hot water.

Cold. Cold acts best when applied continuously, either as evaporating lotions, compresses, or as ice, powdered or in small lumps, wrapped up in a cloth or contained in an ice-bag. In cases of inflammation of the brain and its coverings, a cap composed of coils of leaden tubes (Leiter's tubes), in which cold water circulates, is a very convenient apparatus. During its use, however, the patient must be carefully watched, to prevent undue depression taking place.

Cold acts beneficially in the early stages of inflammation

by contracting (reducing the calibre of) the blood-vessels, and thus lessening the supply of blood to the inflamed area. It also tends to check the emigration of the leucocytes from the vessels into the tissues.

By raising the inflamed part, when that is possible, pain is often relieved and rest obtained. **Elevation of the part.**

Bleeding may be resorted to locally by incisions, scarification, cupping, or leeches. **Local bleeding.**

Our remarks have so far referred more especially to acute inflammation. In chronic inflammation the chief changes are in the tissues rather than in the blood-vessels. The general treatment differs very little from that employed in acute inflammation, except that here the specific remedies and tonics have a wider field of application. The various mineral waters, taken either at home or at the various spas and watering-places at home or abroad, are valuable adjuncts to the treatment. **Treatment of chronic inflammation.**

Locally the favourite remedy is what is known as counter-irritation, a term which expresses itself; this may be applied in various ways, by the blister, seton, caustic, or cautery. **Counter-irritation.**

Massage has of late years been much employed in some forms of chronic inflammation; and it will well repay the nurse to undergo a course of training in the various movements and manipulations employed. **Massage.**

Scott's dressing, which consists of one of the mercurial ointments, is a very favourite remedy in chronic bone and joint inflammations. It is generally applied spread on lint, which is cut up into strips of the required length and breadth. These, together with rest, form the chief of the local measures at our command. **Scott's dressing.**

The treatment of suppuration differs according as the abscess is acute or chronic. It is a generally recognised rule that, in dealing with an acute abscess, when we are sure of our diagnosis, the pus should be evacuated without delay; but especially does this apply to abscesses in certain situations, such as the orbit, the neck, the arm-pit, and the perineum, where important structures may be pressed upon and damaged; also to abscesses in connection with bone (this refers only to acute abscesses, of which alone we are at present speaking) and in the neighbourhood of joints and tendons. The incision is usually made in the most dependent part of the abscess, to allow of free drainage. The **Treatment of suppuration. Acute abscess.**

skin should first be cleansed; to this we shall refer more fully when we come to speak of asepsis and antisepsis. The incision is made to avoid important structures, such as arteries, veins, and nerve-trunks. In small abscesses drainage will usually be unnecessary, but in the case of larger abscesses it will usually be required for a longer or shorter time, the tube being gradually shortened until it can be entirely dispensed with.

After opening an abscess a poultice may be applied instead of a drainage-tube; this is a favourite and often a very good application, for it is not only comforting to the patient, but it aids the removal of the pus; it can, however, only be safely employed where there is a large opening to permit of the complete emptying of the abscess-cavity. In deep abscesses it is usually contra-indicated. In cases where we may be afraid of wounding important structures, especially when the abscess is deep, it will be necessary to dissect very carefully down to the abscess; as soon as pus presents the blades of a pair of dressing-forceps are pushed into the cavity and separated, when the pus flows out. This is known as Hilton's method of opening an abscess, after the famous surgeon who first described it. When we are doubtful of the presence of pus, its formation may be promoted by a poultice.

Hilton's method of opening an abscess.

Treatment of a chronic abscess.

In the case of a chronic abscess it may suffice simply to open it and evacuate the pus; but this is rarely sufficient, and generally requires to be supplemented by scraping the walls to remove the *débris*. These abscesses take a longer time to heal, and not uncommonly a sinus remains, which refuses to close, or does so very slowly; sometimes we find several sinuses leading down to a chronic abscess, which discharge quantities of curdy pus.

In dealing with such abscesses iodoform has been found to be of great value, and one of the best ways of applying it is in the form of an emulsion with glycerine. Strips of lint soaked in this emulsion are used to stuff the abscess-cavity and sinuses with. In so doing care is taken not to pack the cavity too tightly or to use undue force in so doing, otherwise its walls may be damaged and the healing process interfered with.

The abscess-cavity may be scraped with the finger, or a sharp spoon (Volkmann's) may be used; it is then washed

out with some warm antiseptic lotion, such as perchloride of mercury (1-5000).

Chronic abscesses frequently result from the breaking down of enlarged lympathic glands, which are so commonly seen in the neck in tubercular subjects. Here the pus is generally of a cheesy consistence.

In the case of large chronic abscesses, such as the psoas abscess, which results from disease of the bodies of the lumbar vertebræ, the method of aspiration is often adopted before resorting to the very serious procedure of opening the abscess. A hollow needle attached to a syringe is introduced into the cavity, and the contents drawn out by suction. Aspiration is sometimes successful; but it has almost always to be repeated, sometimes several times. After withdrawing the pus glycerine and iodoform emulsion is injected into the cavity. It is of the highest importance to adopt every antiseptic precaution (see chapter. xii.) in all our dealings with such an abscess, otherwise our patient may succumb to one of the forms of blood-poisoning (see Surgical Fevers, chapter xiii.). When a psoas abscess has been opened, the diseased tissue which lines its walls is scraped away as before, and its cavity washed out with lotion. A drainage-tube is almost always necessary, and a counter-opening may be required to procure complete drainage. The cavity will be syringed out, at first perhaps twice a day or oftener, later once daily.

Sometimes instead of drainage firm pressure is applied to bring the walls into firm apposition. Unfortunately this does not often answer in these cases.

A generous and nourishing diet is most necessary in the case of large chronic abscesses, to compensate for the long-continued drain on the blood caused by the chronic suppuration.

Stimulants are often prescribed. Port wine and Burgundy are the most suitable.

Of the treatment by drugs the first place must be given to cod-liver oil, either alone or combined with malt or the compound syrup of the phosphate of iron (chemical food). Other drugs which are often prescribed are quinine and the various vegetable bitters.

The chronic fever so often seen in these cases will be considered later (see Hectic Fever, p. 128).

Diffuse suppuration. In speaking of suppuration we have so far only considered it as localised to form an abscess; but it may be more or less widely diffused, involving the connective tissues or such membranes as the peritoneum. Diffuse suppuration of the tissues is known as cellulitis.

Cellulitis.

Such a condition usually results from what is popularly known as a "poisoned" wound, which has been neglected. The affected part—for example, the arm—presents the signs of acute inflammation, with brawniness and a boggy feeling on examination. The skin may give way, and sloughing or even gangrene ensue. The general symptoms are usually severe.

Treatment of cellulitis. Our treatment is directed to supporting the general health by stimulants when necessary, by light but nutritious food, by freely opening the bowels, and treating symptoms as they arise. Locally it will often be necessary to make incisions into the affected part, more or less numerous and deep, according to the severity of the case. After the incisions have been made the part is enveloped in hot fomentations, which should be frequently changed.

Treatment of ulceration. In our treatment of ulceration it is necessary to discriminate between the different kinds of ulcers, and to apply the appropriate treatment to each. There are, however, certain principles which are applicable to the management of all ulcers. The first of these is rest, which is especially necessary in the case of the lower limbs. Here rest in bed is usually required; the lower end of the bed may be raised on blocks, and the limb laid on a pillow. Next comes cleanliness. Before healing can be looked for both the ulcer itself and also its surroundings must be clean.

When possible we try to remove the cause. Constitutional treatment, too, must not be forgotten, especially in the case of those ulcers which arise from constitutional causes.

Healthy healing ulcer. The healthy healing ulcer seldom requires any special treatment, unless the surface be large, when grafting may be required. Ulcers which are characterised by a pale, flabby, or exuberant state of surface will call for stimulating local treatment, applied as caustics (lunar-caustic or bluestone), or lotions, such as red-lotion (sulphate of zinc and tincture of lavender). When we have to deal with active inflammation affecting an ulcer soothing remedies are indicated, such as warm boracic or lead-and-opium lotions.

In the callous ulcer, the common ulcer of the leg, our resources may be taxed to the uttermost. In addition to the general principles we have referred to, which must be rigidly enforced, we try to act on the edges and the surroundings of the ulcer, which are usually brawny, hard, and raised, by some form of ointment. Strapping the ulcer is often useful, but it is apt to be uncleanly, and requires much patience and care for its success. The writer has got good results in such a case from the application of oxygen gas to the surface of the ulcer, the leg being enveloped in a bag connected by a piece of tubing to the cylinder of gas. This treatment, as advocated by Stoker, is now largely used in the management of many wounds. In some cases amputation is the only remedy. **Callous ulcer.**

The table on p. 110 gives in outline the management of the commoner ulcers.

In a threatened case of gangrene we must endeavour to remove the cause. For this reason early operation in a case of strangulated hernia is so necessary, in order to relieve the constricted bowel. Another point in the management of threatened gangrene is to keep the part warm, and so favour the circulation. **Treatment of gangrene, threatened and inevitable.**

In dry gangrene, such as may affect the finger or toe, we wait until a distinct line (the line of demarcation) between the living and the dead tissue is formed before removing the affected part. **Dry gangrene.**

In the case of moist gangrene, which may either remain localised or may spread rapidly, amputation is often required, and may have to be performed without delay in order to save life. Moist gangrene often follows severe crushes or bruises. Even in its milder forms gangrene is always a serious malady, and the strength must be supported by a nourishing diet. Stimulants are generally required. The pain, which is often severe, must be controlled by opium. **Moist gangrene.**

There is a rare form of gangrene known as cancrum oris, or gangrenous stomatitis, which merely requires mention. Attacking the inside of the cheek in debilitated and badly fed children, it tends to spread rapidly, involving the whole thickness of the cheek. Strong measures are necessary to stop the disease and to save life. Removing the black slough on the inside of the cheek, we apply strong nitric acid, or in less severe cases borax and glycerine **Cancrum oris.**

CHAPTER XII.

WOUNDS AND THEIR MANAGEMENT.

In speaking of wounds we include those which result from accident and those which are made by the surgeon. We shall have to consider the local and general effects of injury, using this term in its widest sense.

Contusions. Before, however, describing the varieties of wounds, it will be necessary to refer to contusions. These we may regard as wounds without the skin being broken—in fact, as subcutaneous wounds. They result from a blow or other form of violence. When the skin alone is affected, the blood, which is poured out, produces what we know as a bruise, which passes through the colours we are all acquainted with.

Results of contusion. As a result of a contusion we may have a rapid absorption of the blood; or, in more severe cases, sloughing and even gangrene may ensue. Pain and swelling are usually present in greater or less degree, and sometimes shock, which we shall have to consider later. A contusion may predispose a structure to tuberculosis; especially is this liable to occur in a bone or joint. A tubercular joint often owes its commencement to an injury, perhaps so slight that the patient has forgotten all about it.

Management of contusions. In managing a contusion we enforce rest; in the earlier stages cold is useful to limit the outpouring of blood, but where the bruising is severe cold may act injuriously by lowering the vitality of the part and favouring gangrene. Here it is better to wrap up the part in cotton-wool. Where the effusion is not absorbed readily, some stimulating lotion or liniment may be employed to effect this.

Classification of wounds. It is customary to divide wounds into four groups—incised, lacerated, contused, and punctured.

Incised wounds.

(1) Incised wounds are clean-cut, and are usually produced by a knife; but they may be inflicted by a blunt weapon. Such wounds are very liable to bleed. They are often very painful.

Lacerated wounds.

(2) Lacerated wounds are those in which the tissues are more or less extensively torn. They do not bleed much as a rule, sometimes not at all, owing to the twisting of the injured blood-vessels, which is brought about by the injury. Such wounds are often the result of machinery accidents, and they are specially liable to complications, such as the various forms of blood-poisoning, which we shall discuss later.

Contused wounds.

(3) Contused wounds are those characterised by bruising of the tissues, and are usually combined with the former group. These wounds present much the same characters as do lacerated wounds, and are liable to the same complications.

Punctured wounds

(4) Punctured wounds may be very slight, such as those produced by a needle or a splinter driven into the skin; on the other hand, they may be very severe and rapidly fatal, when caused by a weapon, such as a sword or dagger. The special dangers associated with severe punctured wounds are hæmorrhage, and the opening into important cavities, as the chest or abdomen. In such wounds the depth may be very great. Suppuration, when it occurs, is usually dangerous on this account.

Special wounds, such as gun-shot wounds, need not occupy us.

The healing of wounds.

The healing of wounds commonly takes place by one of two processes—namely, by first or by second intention.

Union by first intention.

To favour union by first intention is usually the aim and ambition of every surgeon; and to procure it all sources of irritation and suppuration must be prevented, and the surfaces of the wound must be in contact. This refers to the incised wounds, for it is the exception for the others so to heal.

In this process a sticky fluid—lymph—is poured out from the surfaces of the wound, which binds these surfaces together; later on new blood-vessels are formed, and also numerous small cells, which are eventually converted into fibrous tissue. The healing is generally completed in from ten to fourteen days.

Causes which may prevent healing by first intention.

Union by first intention may be prevented by many causes, among the most common of which are: (1) want

of antiseptic precautions (see below); (2) want of complete rest; (3) tension, caused by accumulation of the serum poured out from the wound; (4) foreign bodies, such as blood-clot, in the wound; (5) lowered vitality of the tissues, resulting from general ill health, bad surroundings, and alcoholism.

Healing by second intention. Healing by second intention, or, as it is sometimes called, healing by granulation, occurs in wounds whose surfaces cannot be brought into apposition. After hæmorrhage has been arrested, such a wound presents a glazed appearance, due to the serum poured out; and then little red spots—the granulations—appear and gradually close up the wound; the resulting fibrous tissue contracts little by little, and a scar is eventually left.

The principles to be observed in the management of wounds. In discussing the treatment of wounds, we must consider the means of arresting the hæmorrhage (see chapter xiii.); the cleansing of the wound, which includes both asepsis and antisepsis; the apposition of the wound surfaces by sutures; the protection of the wound by dressings; the methods adopted to procure absolute rest; drainage; and, lastly, general treatment.

Cleanliness. Antisepsis and asepsis. (1) Cleanliness. Since Lister's valuable discovery of antisepsis, the treatment of wounds has been placed on an entirely new basis. He recognised that the chief danger in treating both accidental and operation wounds lay in the putrefactive changes which are so liable to take place in them. Such processes being set up by organisms, which are present everywhere in greater or less numbers, he sought to exclude them from wounds by employing substances hostile to them, and also to kill those which had gained access to such wounds. These substances he named antiseptics (Gk. *anti*, against; *sēpsis*, putrefaction). It is of importance to apply antiseptics to everything which comes in contact with a wound rather than to the wound itself, although both methods may have to be adopted in some cases.

The antiseptics in common use are carbolic acid, perchloride of mercury, and iodoform; but many others are also used.

Carbolic acid. Carbolic acid is irritating, and should only be applied to the wound itself when there is reason to believe that germs have been admitted. The common solutions of carbolic are 1-40 and 1-20.

Perchloride of mercury (corrosive sublimate) is a valuable antiseptic; but on account of its poisonous qualities it can only be used in weak solutions, as 1-1000, or even as weak as 1-5000. **Perchloride of mercury.**

All instruments, sponges, ligatures, and drainage-tubes must not only be thoroughly clean, but kept in an antiseptic solution while in use. The nurse's hands should be thoroughly washed and scrubbed with a nail-brush, and then well rinsed in an antiseptic before she brings them into contact with a wound. The patient's skin before operation must be carefully prepared in the way we shall see when discussing operations and their management. By following these precautions most rigorously, we are able as a rule to render everything aseptic.

Asepsis (Gk. *a*, negative; *sēpsis*, putrefaction) is what we should all aim at; and were we sure that we could exclude organisms by thorough cleanliness, then we could dispense, at any rate very largely, with antiseptics in treating our wounds; but unfortunately we often cannot rely on asepsis, and consequently have to make use of some antiseptic. **Asepsis.**

Lister in 1889 drew attention to the value of a compound of mercury and zinc as an antiseptic; it is a double cyanide of these metals, and is now used a good deal as cyanide gauze for dressing wounds. It may also be used as a dusting-powder for wounds. **Double cyanide of mercury and zinc a good antiseptic dressing.**

In accidental wounds an antiseptic is necessary. Sometimes we may let the wound soak for some time in the antiseptic, and then wash it well out by means of the irrigator; or, in the case of a severe lacerated wound of one of the limbs, good results may be got by immersing the limb in a warm antiseptic solution, such as boracic lotion, the water being kept at a fixed temperature. This may be continued sometimes for several days.

We may stop a moment to enquire how it is that these germs, which are omnipresent, do not harm us in health. The white corpuscles of the blood have the power of taking into their interior these micro-organisms and of digesting them. When, however, from any cause the white corpuscles fail to do this, or become outnumbered by these germs, then it is that disease arises. This theory of the action of the white corpuscles was brought forward some years ago

Phagocytosis.

by Metschnikoff, to which he applied the term phagocytosis (Gk. *phagō*, I eat).

In addition to asepsis and antisepsis, which we have seen to be so important in the management of wounds, cleanliness implies the removal of any foreign body or blood-clot from a wound. This should be done very gently, and the wound left as dry as possible, since this lessens the liability to fermentative changes taking place in it.

Apposition of the wound surfaces by sutures.

(2) Apposition of the wound surfaces by sutures. In very small wounds it may suffice to hermetically seal them with a film of cotton-wool, over which a layer of collodion or friar's balsam is painted.

Sutures.

To bring the edges of wounds into apposition we generally make use of sutures. Catgut, silkworm-gut, silver wire, silk, and horse-hair are the most commonly used sutures. Catgut is absorbed by the tissues; silk is not so absorbed, but remains as a non-irritating substance, and rarely causes trouble. Silver wire is apt to set up inflammation if it is left in too long. It does not absorb the discharges from the wounds, as does silk, and it is usually non-irritating. Horse-hair is very useful in small wounds, especially those on the face; it is somewhat elastic and yielding, and rarely causes any irritation. For deep sutures catgut, in one of its forms, is the most reliable.

All sutures must be made thoroughly aseptic by being soaked in carbolic lotion (1-20). The edges of the wound should be in exact apposition, any turning in of them being carefully avoided.

Sutures may be interrupted or continuous, and there are some other special varieties that need not now detain us.

The forms of needles in use are various; they may be more or less curved or straight. Sometimes needles mounted on a handle are used, and many forms of needle-holders have been devised to assist the surgeon in passing sutures through the tissues.

Dressings.

(3) Dressings. After closing the wound we proceed to apply some form of dressing, previously dusting an antiseptic powder, as iodoform or boracic acid, over the wound, if necessary, before the dressing is placed over it. We usually put one or more layers of antiseptic gauze, such as cyanide or sal-alembroth, next the wound, the first layer sometimes being moistened. We apply more gauze in the case of open

or discharging wounds than in wounds which are dry. Over the gauze is placed some form of cotton-wool, which need not necessarily be impregnated with an antiseptic, as the wool acts as a filter, and prevents the transmission of germs. To prevent the dressings sticking a layer of green protective is sometimes placed next the wound.

Bandages will be considered separately (see chapter xx.).

There are of course many kinds of antiseptic dressing, each surgeon preferring that variety with which he is accustomed to work. As long as they answer the requirements of antisepsis and asepsis that is all that is necessary.

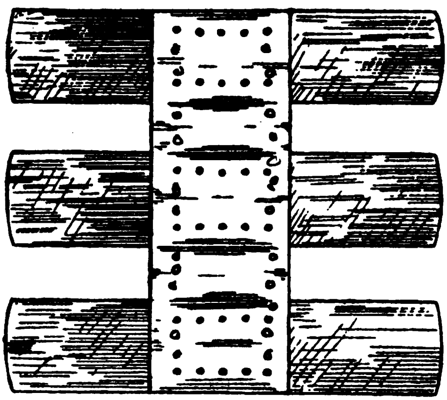


FIG. 20.

(4) Absolute rest. This we have seen to be of the greatest importance, to allow of healing by first intention. Wounds should not be dressed until such time as healing may reasonably be expected to have occurred, unless special circumstances demand it. The guides on which we rely chiefly are the temperature, pulse, discharge, and sensations experienced by the patient. A rise of temperature, an increase in the frequency of the pulse, and pain in the wound usually indicate that dressing is required. **Absolute rest.**

Where there is a tube in the wound, or where suppuration is present, dressing of the wound must be undertaken daily, or as often as is considered necessary by the surgeon.

After bandaging a wound means must be taken to keep

the part at rest, either on a splint, pillow, or other appliance. Splints[1] may be made of wood or of lead or other material. An illustration is given of a splint made of lead (fig. 20) such as might be used with advantage in the case of a compound fracture. The side-pieces are bent up to form a box for the limb, when the dressing is completed. This kind of splint is very comfortable, and its weight prevents undue movement of the part.

Drainage.

(5) Drainage. In most incised wounds which we can bring together drainage is unnecessary, unless the wound be a very large one, when we may require to put a tube in for twenty-four or forty-eight hours to avoid tension. In septic wounds we must employ drainage to remove the products of suppuration.

In employing drainage the tube should be placed at the most dependent part of the wound. It should not be kept in any longer than is absolutely necessary, otherwise it will promote suppuration by acting as a foreign body. On the other hand, if removed too soon, the discharge may accumulate in the deeper part of the wound and give rise to trouble. India-rubber tubing of different sizes with holes cut in it laterally is usually used. Before being introduced the tube is thoroughly rinsed in an antiseptic lotion, and is generally fixed in the wound with a safety-pin to prevent it passing completely below the skin. The end of the tube outside the wound is surrounded with gauze, into which the discharge passes.

Drainage-tubes are now used much less frequently than formerly, owing to the improved methods of managing wounds. Instead of rubber tubing, we may, in the case of small wounds where drainage is required, employ a leash of catgut or horse-hair.

General treatment.

(6) General treatment. Included under this heading are the management of the condition known as shock, and also the arrangement of the patient's surroundings. Fresh air has been abundantly shown to be of great importance in the healing of wounds. Regulation of the bowels, the relief of pain, sleeplessness, a suitable diet, according to the requirements of the case, and all that conduces to the general comfort and cheerfulness of the patient, must be carefully attended to.

[1] Splints are discussed with bandages in chapter xx.

CHAPTER XIII.

THE COMPLICATIONS OF WOUNDS.

UNDER this heading will be included hæmorrhage, shock, the various fevers associated with wounds, erysipelas, and two other diseases—namely, lock-jaw (tetanus) and rabies (hydrophobia).

Hæmorrhage. Hæmorrhage is usually present in a wound, and can only be regarded as a complication when it is profuse or returns after the wound has been treated.

Hæmorrhage may arise from the arteries (arterial), the veins (venous), or the capillaries (capillary).

Arterial. Arterial hæmorrhage can be recognised by the blood being discharged in jets corresponding with each beat of the heart.

Venous. Venous hæmorrhage, on the other hand, is continuous, and wells up from the wound. The blood is dark red or purplish in colour.

Capillary. Capillary hæmorrhage is usually bright coloured, and occurs as a general oozing rather than as a flow of blood.

Symptoms of hæmorrhage. The symptoms of hæmorrhage depend more on the rapidity of the loss of blood than on the actual quantity lost, and also on the effects produced by that loss. The patient is usually pale, the skin cold and clammy, the pulse rapid and feeble. There may be yawning, flashes before the eyes, faintness, which may end in actual fainting, arising from a deficient supply of blood to the brain, and even death. If recovery take place, vomiting is apt to occur.

Where repeated hæmorrhages occur, the patient is apt to be restless and to throw his arms about. The temperature is occasionally very much raised in some cases of hæmorrhage before death. This is due to changes taking place in the brain, and is sometimes seen in cases of cerebral hæmorrhage, as shown in the chart (fig. 21), where the

temperature reached 106·8° F. just before death. Bleeding from an artery is usually more serious than bleeding from a vein of relative size.

Management of hæmorrhage. In the management of a case of hæmorrhage the first indication is of course to stop the bleeding in one of the ways we are about to consider, either temporarily or if possible permanently. The patient must be kept lying down and at absolute rest. In cases of heart failure from long-continued or rapid loss of blood it may be necessary to adopt measures for stimulating the heart. Stimulants

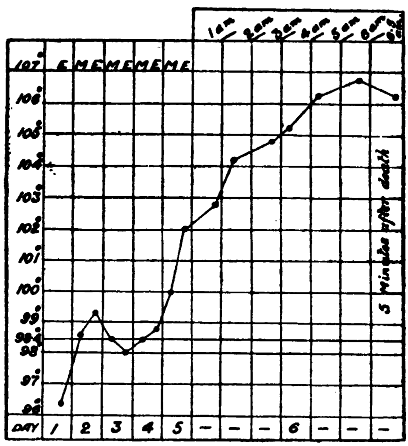


FIG. 21.—TEMPERATURE CHART FROM A FATAL CASE OF CEREBRAL HÆMORRHAGE IN A MAN AGED FIFTY-TWO.

are given by the mouth or per rectum, or, when a rapid action is called for, they are injected under the skin. Such drugs as ether, sal-volatile, digitalis, strychnine, and especially alcohol, are of great value in these cases. The head should be kept low, and the limbs may be wrapped up in cotton-wool, and hot bottles applied to the lower limbs. The extremities are sometimes bandaged from below upwards to drive the blood to the brain. It is almost needless to say that the nurse must on no account administer any form of stimulant on her own responsibility in such cases as these; for she may do much harm by interfering with nature's

method of stopping bleeding. When faintness supervenes, the blood flows more slowly and tends to clot, and thus the bleeding may be arrested. This refers more especially to cases of internal hæmorrhage which are beyond our reach.

Transfusion. In very severe cases it may be necessary to employ transfusion, using either blood or a saline solution, such as phosphate of soda or a combination of the two. This does good by giving the heart something to act upon. The solution is injected carefully into a vein to the amount of from two to eight ounces. The admission of air and clotting of the blood are prevented by filling the syringe full before injecting the fluid, and by not allowing the blood to fall below the temperature of 98° F. After the urgent symptoms have been relieved the diet must be carefully regulated, fluid food only, in small quantity and at frequent intervals, being allowed at first, to be gradually followed by fish, poultry, and finally butcher-meat. Tonics and change of air will generally be required subsequently.

Our remarks have applied more especially to external hæmorrhage. Cases of severe internal hæmorrhage, as from the stomach, bowels, lungs, or from the bursting of an aneurism, will be referred to under their respective diseases.

Means of arresting hæmorrhage. The means at our disposal for the arrest of hæmorrhage are divided into temporary and permanent.

Temporary measures. Finger. (1) Temporary measures. These include the finger, the artery-forceps, and the tourniquet. The finger may be applied to the bleeding point, or to the main artery of the limb, or to a large branch which supplies the affected part with blood.

Artery-forceps. Various kinds of artery-forceps are in use, but the principle on which they act is much the same in all. Those which bear the name of Spencer-Wells are most commonly used.

Tourniquets. Of tourniquets that known as Esmarch's is now much used. It consists of a stout piece of rubber tubing with a hook and chain at the two ends. The tubing is wound tightly round the limb above the bleeding spot or above the site of the incision in an operation such as amputation of a limb or a portion of a limb, or excision of a joint. Underneath it is placed a strip of lint or other fabric, to prevent undue compression and bruising of the tissues. It is gradually relaxed, when the bleeding vessels are either tied or twisted.

Permanent measures. (2) Permanent measures. These include the ligature, torsion, the application of heat, cold, styptics, the cautery, and also pressure.

Ligature. The ligature is the method most frequently adopted. Silk and catgut, specially prepared and rendered surgically clean, are the materials generally employed. They are used in different thicknesses, according to the size of the vessel which has to be tied. The ligature may be applied to cut vessels or to arteries uncut, as when an artery is tied to cure an aneurism. In tying a ligature the reef-knot should be employed, as being firmer and less likely to slip than the granny. It is well to practise the reef-knot, and to substitute it always for the granny, as, for example, in tying the shoe-laces.

Torsion. Torsion consists in seizing the vessel with a pair of catch-forceps, and forcibly twisting it several times. This is what happens in the case of a lacerated wound, and accounts for the absence of bleeding which we usually notice in such an accident. Torsion is only applicable to small vessels.

Heat. Heat is often used to arrest hæmorrhage. The water must be really hot (110°—120° F.), and not merely warm, to be effectual. A good example of the treatment of hæmorrhage by heat is seen in that severe and often fatal form of bleeding (post-partum hæmorrhage) which occasionally takes place immediately or soon after delivery. By injecting hot water into its cavity the uterus is stimulated to contract, and the blood-vessels are thus sealed.

Cold. Cold acts in much the same way as heat in checking hæmorrhage; but, unlike heat, it is only of value in general oozing, and is useless in smart hæmorrhage. It may be applied as ice or ice-cold water, and is very useful to bathe a stump with after amputation, where general oozing is taking place.

Styptics. Styptics are substances which, when applied to a bleeding surface, tend to check hæmorrhage by promoting the coagulation of the blood. They are not now so much used as they formerly were. The one most commonly employed is perchloride of iron. They tend to injure the tissues by their powerful chemical action.

Cautery. The cautery is sometimes employed to stop bleeding. It is used at a dull red heat, not actually red hot. It is especially applicable in operations for piles (hæmorrhoids).

Finally, we must mention pressure. This may be applied in various ways, as a pad of lint over a bleeding spot with a tight bandage, or as a plug stuffed into a cavity. Such a plug may be made by inserting into a cavity, such as the interior of a bone, a piece of protective, into which is tightly packed gauze or cotton-wool (fig. 22). This may also be effected by a dry sponge. In wounds of the hand, where the large vessels in the palm may be involved, bleeding is sometimes very hard to stop. In such a case a firm pad may be placed in the bend of the elbow, and the forearm bent forcibly on the upper arm, and bandaged to it in this position. This can generally only be done for a short time, on account of the pain it produces, and the risk of gangrene from obstructed circulation. **Pressure**

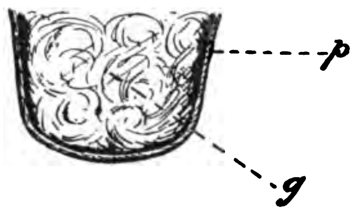


FIG. 22.—CAVITY PACKED WITH GAUZE OR COTTON-WOOL, ENCLOSED IN A PIECE OF PROTECTIVE TO ARREST HÆMORRHAGE.
p. Protective. *g*. Gauze or cotton-wool.

Primary hæmorrhage.

Hæmorrhage is regarded as primary when it occurs at the time of the accident or during an operation. When it occurs within twenty-four hours of the injury or operation, it is known as reactionary, because of its tendency to come on during the reaction period. Any hæmorrhage occurring after twenty-four hours is spoken of as secondary. This is rare now. For primary hæmorrhage one or more of the measures we have referred to are employed—the tourniquet or pressure with the fingers or artery-forceps, followed by the ligature or other application, with attention to general treatment. In reactionary hæmorrhage elevation of the part, when possible, with pressure, should be tried. Syringing out with hot water may serve to check the bleeding; if this fail, the wound is opened up, and the bleeding points secured and tied.

Reactionary hæmorrhage. **Secondary hæmorrhage.**

Shock.

The condition known as shock is due to powerful impressions made on the nervous system. It is often brought on by severe injuries, such as burns and scalds, especially when such injuries involve certain parts of the

body, as, for example, the abdomen. It is seen, too, in cases of severe hæmorrhage, and sometimes after serious and prolonged operations. Various conditions favour its occurrence, as bad health and insufficient food.

Symptoms. The symptoms vary greatly in different cases. In a severe case, such as might follow a compound fracture of the thigh, the patient lies quiet. He is pale, and is covered with a cold, clammy sweat. His pulse is feeble, or perhaps cannot be felt at the wrist; his respiration is shallow; and he lies with his eyes half open, and is only partially conscious. The control of the bowels and bladder is temporarily lost. If he complain of no pain, the outlook is more grave.

These symptoms may continue, and death result; but, more often, after a longer or shorter period, the period of reaction comes on. The temperature, which was below normal, now rises; the pulse becomes stronger; and sickness often comes on, with other signs of fever, such as dryness of the skin and constipation.

Shock may be delayed in cases of great excitement, as is frequently seen on the battle-field. It may also be attended with great restlessness and excitement. This is a bad form.

Management. Our first indication in managing a case of shock is to apply warmth to the body. Hot bottles, carefully protected, or hot bricks should be applied to the feet, and a quickly acting stimulant given by the mouth, if medical advice is not at once forthcoming. Ether, sal-volatile, and brandy are most generally used for this purpose. Nourishment may be given by the rectum, either as a nutrient enema or suppository.

When reaction comes on symptoms such as fever, vomiting, and pain will call for treatment. For the last named opium or morphia is usually required.

Surgical fevers. We now come to a group of diseases known as the surgical fevers, because they are for the most part concerned with the production of wounds.

Traumatic fever. (1) The first of these is known as traumatic fever (belonging to or caused by a wound). This is commonly seen as the result of an injury, such as a severe blow or simple fracture, or an operation where the wound is perfectly healthy. It rarely lasts more than a few days, and requires no treatment. The temperature may reach 101° F., but soon falls. The usual symptoms of mild fever are present—

the coated tongue, loss of appetite, and rapid pulse. It must be borne in mind that this condition is in no way dependent upon germs, and is thus distinguished from the remaining members of this group, which owe their origin to the introduction into the blood either of germs or of poisons produced by them.

Sapræmia, or septic intoxication.

(2) Sapræmia, or septic intoxication. This disease occurs as a result of putrefactive processes set up by certain germs (the germs of putrefaction), which produce poisons called ptomaines. These poisons, when absorbed into the blood, produce certain symptoms, which depend for their severity on the quantity absorbed. We may have therefore a mild sapræmia following upon a small dose of the poison, and a severe form of the disease when the amount of poison in the blood is large. In the latter case, which may be combined with the next type of fever to be considered, namely septicæmia, death may result.

When the putrefaction is removed, the symptoms of sapræmia depart, provided the quantity of poison absorbed has not been too large. The poison does not multiply in the blood, nor is the blood infective, as it is in septicæmia.

Sapræmia is often present in the case of a septic wound, where death of the tissues has occurred, with consequent putrefaction. In a mild case the temperature begins to rise more or less suddenly about the second day following an accident, such as a compound fracture with a septic wound. It may reach 102° or 103°, and continue at this level for two or three days. It generally falls on or before the ninth day, when the wound is healing. The symptoms are those of mild fever—namely, thirst, loss of appetite, constipation, headache, and perhaps slight delirium. The skin is hot and the tongue coated. In the severe form of the disease there is usually shivering, with a rapid rise of temperature. The pulse is quick and feeble; the tongue brown, glazed, and parched. Vomiting and diarrhœa are often present, and there is great prostration. The disease may advance, and the patient become unconscious. The temperature now often falls, and death may result even as early as the third or fourth day.

Management.

The management of sapræmia is both preventive and curative. The former consists in the strict observance of the principles of asepsis and antisepsis in dealing with

wounds. Thereby putrefaction is avoided. When putrefaction has, however, occurred, it must be removed with the least possible delay. In dealing with a septic wound we endeavour to establish free drainage, using mild non-irritating antiseptic lotions. In severe cases the question of amputation may have to be considered in order to save life. The strength must be maintained to the full by plenty of nourishment given at short intervals, stimulants, and drugs such as digitalis and strychnine to strengthen the heart.

Septicæmia, or septic infection. (3) Septicæmia, or septic infection. Whereas sapræmia has been seen to be the result of the absorption of poisons resulting from putrefaction, septicæmia is due to a living poison, a germ, which, having gained admission to the blood, multiplies there with alarming rapidity. If a small quantity of the blood of a person suffering from this disease were injected into one of the lower animals, for example the guinea-pig, the animal would become affected; the blood is, in short, infective. The poison may gain admission into the blood through a small prick on the finger, such as may occur during the making of a post-mortem examination. Such a mode of origin is unfortunately only too common, and constitutes a serious risk in the examination of subjects recently dead of the disease.

Supposing the poison to have gained admission in such a manner as we have indicated, symptoms may arise even in twelve hours' time. The lymphatic vessels of the arm soon become affected, and stand out as red lines coursing up the arm, which is now swollen and tender. Other early symptoms are rigors and great prostration. The temperature may quickly rise to 104° or 105° F. The symptoms are very similar to those of severe sapræmia, their severity, however, being out of all proportion to the size of the wound.

Management. The management of septicæmia is by no means so satisfactory as is that of sapræmia, for we cannot remove the cause; the poison is not merely circulating, but is also multiplying in the blood. We cleanse a septic wound as thoroughly as we can, as we have already seen. It is even more necessary in this disease to support the strength by every means in our power. During the last few years the application of the serum method of treating disease has been

extended to this affection. The results have been distinctly satisfactory when the serum has been used sufficiently early. If its use is delayed, the results are more unfavourable. An account of the serum treatment of disease will be given when we come to speak of diphtheria (see p. 257).

(4) Pyæmia. In this disease, which is closely allied to septicæmia, germs gain admission into the blood by the veins which lead away from the seat of suppuration. These germs, which may be contained in fragments of blood-clot (emboli) which have become dislodged, or in the leucocytes, are carried by the veins to the right side of the heart, and thence to the lungs, where, becoming arrested, an abscess is formed; or again, passing through the capillaries of the lung, they may reach the various organs and tissues of the body. Thus arise the numerous abscesses which characterise this disease. **Pyæmia.**

Pyæmia never occurs without suppuration.

Where there is a wound, pyæmia is usually preceded by a change in its appearance. Its edges become puffy and swollen. Feverish symptoms develop, or, if already present, become exaggerated. But the most characteristic sign of the disease is a severe rigor, with a rapid rise of temperature. The rigor may last only a few minutes, or possibly an hour or more, and with its departure the temperature falls and sweating ensues. Pyæmia generally commences about the tenth day after an accident or wound, and there may be one or several rigors in the first twenty-four hours.

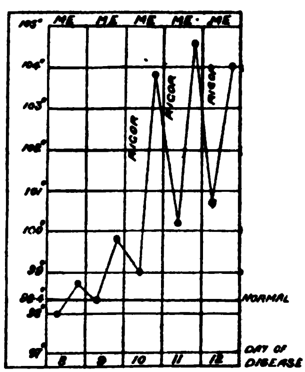


FIG. 23.—TEMPERATURE CHART IN A CASE OF PYÆMIA, WITH DAILY RIGOR FOLLOWED BY SWEATING.

The chart (fig. 23) represents a case with a rigor occurring daily in the latter part of the day. The temperature does not usually fall to normal, at any rate at first, as we shall find it does in hectic fever. The additional symptoms correspond very closely with those we have already

mentioned. It is usually some days, often a week, before the abscesses appear. These, as we have seen, may form anywhere; but the lungs are generally first affected, as being the first resting-place of the germs.

The liver, spleen, kidneys, and the joints are often the seat of abscesses in this disease. As the patient becomes worse the rigors become more frequent, the pulse weaker and more rapid, and pleurisy or pneumonia may now set in. Death results usually from gradual heart failure and exhaustion, but it may occasionally occur suddenly. Sometimes pyæmia runs a more chronic course, when recovery is more hopeful, but often at the expense of one or more disorganised and stiff joints, as a result of abscess formation and consequent destruction.

Treatment. The treatment of acute pyæmia offers but little hope when the disease is established. The management differs little from that of severe sapræmia and septicæmia. Quinine given in large doses in anticipation of a rigor may tend to check it, but it is of no great value. After the rigor, when the patient is left prostrate, a quickly acting stimulant will usually be required. Locally, wounds must be carefully drained and cleansed; but this is to be regarded rather as a preventive measure. Amputation may be required.

Abscesses are opened as soon as they are diagnosed and treated on antiseptic lines.

In the event of recovery, tonics, change of air, and a generous dietary will be ordered.

It cannot be too strongly impressed upon the nurse that this and the two preceding diseases are to a certain extent preventable by strict attention to cleanliness, both generally and locally, in the case of a wound.

Hectic fever. (5) Hectic fever. This, the last of the surgical fevers, occurs as a result of long-standing suppuration, and is most commonly seen in the case of chronic abscesses which have been opened and continue to discharge, and also in phthisis. It may best be regarded as a form of chronic blood-poisoning, arising from the absorption into the blood of small quantities of poisons derived from the germs which produce the suppuration.

Symptoms. Hectic fever is characterised by a gradual onset. The prominent symptoms in a well-marked case are the peculiar hectic temperature, which rises in the afternoon and falls

in the early morning, loss of appetite and of flesh, and a quick pulse. The patient is usually pale, but there is a flush (hectic flush) on the cheeks. There is profuse sweating in the early morning, coincident with the fall of temperature. In the later stages diarrhœa, often of a most intractable type, is a distressing symptom. The patient gradually sinks from exhaustion.

Management. We try to remove the source of suppuration, but this may be impossible. Often we can do nothing beyond relieving symptoms. The patient should sleep in flannel, so as to prevent being chilled by the copious perspiration. The diet should include an abundant supply of milk, also eggs and butter, when these can be digested. Cod-liver oil is commonly prescribed, rather as a food than a medicine. For the sweating belladonna, or its active ingredient atropine, is commonly used, also oxide of zinc. Tepid sponging is, however, sometimes sufficient to give relief. To control the diarrhœa opium may be required. Sulphate of copper in pill form is a favourite remedy, which may be combined with opium. When considering the management of phthisis, we shall have to refer to this form of diarrhœa again.

Erysipelas. Erysipelas, popularly known as "the rose," is regarded by some as merely a severe inflammation of the skin; but most authorities consider it to be due to a germ closely allied to those which are responsible for acute abscess formation. Erysipelas has come to be a widely used term, but it should be used to designate a severe infective inflammation of the skin which is unaccompanied by suppuration. It occurs as a bright red blush, with a sharply defined edge. It is liable to attack wounds, but may occur where there is no visible breach of the skin surface. Probably wounds on the scalp are those most commonly attacked, especially when they occur in alcoholic subjects. Its contagious nature is shown by its liability to be spread by the hands, instruments, sponges, etc. It is possible that the disease may also be conveyed by the air. It is usually preceded by a rise of temperature for which no cause can be assigned, a general feeling of illness, and perhaps an attack of vomiting. It is apt to spread quickly, especially when loose tissues, such as those of the face, are attacked. There may be severe constitutional symptoms, such as headache, rapid

pulse, delirium, and great exhaustion. The duration of the disease is uncertain; it may last only a couple of days, or a fortnight or longer. The redness of the skin gradually fades away, and the swelling and stiffness of the affected part disappear. Erysipelas is seldom dangerous to life; but when the head is attacked the outlook is more grave, for there is a risk of meningitis. Again, when occurring in the neighbourhood of the neck or face, the larynx may become affected, and a severe form of laryngitis ensue, which may soon end fatally.

Treatment. The treatment must be both preventive and curative. We must avoid over-crowding, especially in surgical wards. The disease has become much rarer since the adoption of the antiseptic treatment of wounds. Sponges, instruments, and hands must be rendered thoroughly aseptic. When a suspicious case of the disease arises, the patient must at once be isolated. In many of our larger hospitals an observation ward is set apart for cases such as these. No nurse who has attended to a case of even doubtful erysipelas must dress any other wounds. The bedding must be stoved and disinfection carried out.

The curative treatment is both local and general. When there is a wound, it must be rendered as healthy as possible; it is almost sure to be septic. The inflamed skin is dusted with flour or zinc-and-starch powder, and wrapped up in cotton-wool to exclude the air. In the case of the face a cotton-wool mask should be made. Small punctures or incisions may be required when there is much tension; this is, however, more likely to occur when the deeper tissues are involved. Tincture of iodine or a mixture of the tincture and liniment painted round the spreading margin sometimes limits the disease; it also has the advantage of being antiseptic.

As regards general treatment, a slop diet is ordered; stimulants are only prescribed in more severe cases, when the pulse is weak and rapid, and in old people. Champagne is often of great value in such cases, also brandy-and-egg mixture. The most commonly used drug in erysipelas is perchloride of iron (steel drops), given well diluted with water, to prevent irritation of the walls of the stomach. The mouth should be well washed out after taking it, to prevent any blackening of the teeth. Opium is often re-

quired to relieve pain and procure sleep. A brisk purge is given at the commencement of the disease, such as Epsom salts or calomel. In the debilitated, and when convalescence is protracted, a favourite mixture employed is one containing sal-volatile and bark (cinchona).

Tetanus, or lock-jaw, is a disease which we now know to be caused by a germ (a bacillus) which is often found in connection with soil. It occurs generally in connection with wounds, especially those into which soil has been admitted, and those which have become septic; but it frequently arises where there has been no wound. **Tetanus, lock-jaw.**

Tetanus may arise even in twenty-four hours after the production of a wound; it is rare after the tenth day. A feeling of stiffness about the jaws is first noticed; this gradually increases, and is presently accompanied by severe muscular spasms, which are aggravated by the slightest cause, such as the shutting of a door. **Symptoms.**

Poisoning by strychnine somewhat resembles this disease; but as we shall point out when we come to speak of strychnine poisoning, the spasms never entirely disappear in tetanus, as they do in strychnine poisoning, and they commence first of all in the muscles of the jaw in the former case, which gives the name (lock-jaw) to the disease.

The spasms increase in both severity and frequency, and eventually most of the muscles of the body become thus affected, and death occurs in nearly every case, most commonly from exhaustion. The jaws are tightly clenched, and the back is arched, so that the patient may during a paroxysm simply rest on the back of his head and his heels, the rest of the body being completely lifted off the bed.

In the management of this fatal disease many drugs have been recommended with a view to arresting or lessening the spasms, but none of them can be said to be of any great value. Chloroform inhalation gives relief while the patient is under its influence, but the benefit can only be temporary. **Management.**

Recently the serum treatment has been used in this disease with some measure of success; for there are cases on record which have recovered under its use. Accordingly every case of tetanus should be treated by this measure, as affording by far the best chance of recovery that we possess. **Serum treatment of tetanus.**

As in the case of other diseases treated by the serum method, to be of use recourse must be had to it at once. The preparation of the tetanus antitoxin is carried out in a manner allied to that adopted for the obtaining of diphtheria antitoxin. The room should be kept darkened and absolutely quiet, and every precaution taken to prevent any aggravation of the spasms.

Feeding by the nose will generally be found to increase the spasms; and if nourishment cannot be given by the mouth, owing to the teeth being firmly clenched, recourse must be had to nutrient enemata and suppositories.

Any wound must be treated on the principles already laid down. The nurse must devote her whole time to the patient, who should on no account be left; she must administer nourishment assiduously. Opium, bromide of potash, or chloral may be prescribed to procure rest; the last named sometimes answers best given as an enema in a dose as large as forty grains.

Rabies, or hydrophobia. The last disease we shall refer to as a complication of wounds is rabies (hydrophobia), a disease which the nurse may possibly meet with. This disease is intimately associated with the name of the late Louis Pasteur, who, by his well-known work, has done so much towards establishing a cure for this dreadful malady.

Rabies is caused by a poison which is usually introduced into the system by the saliva of a rabid animal, usually a dog, who snaps and bites at any one or anything that crosses his path. A bite from a rabid animal is more likely to be followed by the disease when it is on a part of the body, such as the face, which is unprotected by clothing, the clothes tending to protect the skin from the saliva. In cases of bites from rabid animals on an exposed part, 90 per cent. of those thus bitten develop the disease.

Symptoms. The symptoms consist in a sense of irritation about the wound, often long after its production, digestive troubles, and mental depression, followed in a few days by great excitement, with muscular spasm. Death generally occurs in from four to seven days, either from paralysis or from exhaustion.

We have to decide, in a suspicious case, whether the dog be mad or no; and to ascertain this definitely the dog must be killed, and a post-mortem examination made

by an expert. A rabid dog rushes about incoherently, and, as we have said, tends to snap at everything. He mopes about with his tail between his legs and his head hanging down.

Every dog-bite is best cauterised; and in cases where it is decided that the animal inflicting the bite is rabid, the question has to be discussed concerning the adoption of Pasteur's treatment, which has hitherto necessitated a journey to Paris to the Pasteur Institute.

Pasteur's treatment. Briefly, Pasteur's treatment consists in the gradual acclimatisation of the patient to the poison by carefully graduated doses of the poison of increasing strength, until the body, in due course of time, becomes protected. This line of treatment has met with much success in Pasteur's hands.

CHAPTER XIV.

BURNS AND SCALDS.

IT is important for the nurse to be acquainted with the management of burns and scalds, the former being caused by dry heat, the latter by moist.

Classification of burns; six degrees. It is usual to divide burns into six degrees of severity, according to the effects produced by such injuries on the tissues. Burns may merely produce redness of the skin (first degree), or cause blistering (second degree). The skin may be partially or wholly destroyed (third and fourth degrees), or the muscles may be implicated (fifth degree). Lastly, the whole limb may be charred (sixth degree).

The most painful burns are those of the third degree, where the endings of the nerves in the skin are exposed, but not destroyed. Where the muscles are involved and the skin is entirely destroyed great contraction ensues, with consequent deformity.

Symptoms. The constitutional symptoms produced by burns depend more on their extent than their depth. Children bear them badly, as do also those at the other extreme of life. Burns of the body and head are more serious than those of the limbs.

Stage of collapse. In the case of a burn of the abdomen, for example, of moderate severity, the first symptoms are those of collapse, more or less severe. The skin is cold, the pulse rapid and feeble, and there is intense pain, unless the collapse be profound, when it is generally absent, and a fatal issue may be expected.

Stage of reaction. In from twenty-four to forty-eight hours the stage of reaction comes on. The pulse now becomes stronger, there is a rise of temperature, and often sapræmia, arising from the putrefaction and consequent absorption. In children vomiting and convulsions may occur.

It is at this time that inflammation of the internal organs may arise; in such a case as we are considering the peritoneum might be attacked. But pneumonia, pleurisy, and meningitis are all liable to follow burns, according to the part of the body affected.

Following the reaction stage the period of suppuration will ensue, and this may last a variable time. Death may now arise from exhaustion or blood-poisoning, or even from inflammation of the internal organs.

Management of burns and scalds.

The management of burns and scalds includes general and local measures. The collapse, when present, must be treated by the remedies already spoken of when considering shock. We endeavour to promote the reactionary stage by warmth, and sometimes stimulants. Hot blankets and bottles should be gently applied, and the clothing carefully taken off, moving the patient as little as possible. Opium or morphia will usually be required to ease pain. When reaction has set in, the bowels must be freely opened, and nutritious and easily digested food given. Complications must be treated as they arise.

Locally, the treatment depends on the degree of burn. In the first and second degrees hot dry wool should be applied, and the part carefully protected from the air. When large vesicles are present, they should be pricked and dressed with vaseline or boracic ointment. Where the skin is partially or wholly destroyed, mild antiseptics should be used and wool applied as before. It is sometimes good to immerse the affected part in a bath of warm boracic lotion in the severer varieties of burns.

To favour the separation of sloughs poultices are often serviceable, and where there is much putrefaction they should be made of charcoal. Many use oily applications, such as eucalyptus, carbolic, or carron oil. When the sloughs have come away, the ulcer left must be treated on the lines already laid down (see Ulcers, chapter xi.).

It is often necessary in the case of severe burns to transplant or graft skin. Contractions must be prevented as far as possible. For instance, in a burn which affects the side of the chest, let the arm be kept well away from the chest-wall. In the same way the face and chin must be carefully supported by a stiff apparatus, such as a poroplastic collar.

Where contraction has occurred, it may be remedied in

recent cases by gradual extension effected by splints, etc. Only too often, however, this is of no avail, and an operation has to be performed. In forcible stretching under an anæsthetic care must be taken, or an artery may be torn.

In some cases division of the scar gives a good result. Occasionally amputation may be necessary.

Scalding of the throat in children. There is a severe scald which not uncommonly occurs in young children as a result of inhaling steam from a kettle. Swelling of the larynx ensues from the scalding of the throat. The symptoms are usually very urgent, and if not relieved quickly result in death. If such applications as ice, leeches, or some form of heat do not rapidly give relief, the surgeon has to open the larynx or trachea; or what is known as intubation of the larynx may be tried. Such cases require the greatest attention on the part of the nurse. We shall refer to their management when considering tracheotomy.

CHAPTER XV.

INJURIES AND DISEASES OF BONE.

In this chapter we shall confine ourselves almost entirely to the consideration of the commonest injury of bone, namely fracture, the only disease of bone which it will be necessary to refer to being inflammation.

Fractures are divided into simple, where there is no wound of the skin covering the fracture, and compound, where there is a wound of the soft parts leading down to it. **Fractures: simple and compound.** Each of these varieties may be subdivided, according to the extent of the fracture and the condition of the fragments: for example, we speak of complete, incomplete, and comminuted fractures, the last variety occurring when the bone is broken into several pieces. **Other varieties of fractures. Comminuted fracture.** When one of the broken fragments is driven into the other, we say the fracture is impacted. **Impacted fracture.** A depressed fracture occurs in the vault of the skull where one fragment is driven in below the surface. **Depressed fracture.** A fracture may be complicated: for example, by a dislocation. **Complicated fracture.**

The causes of fracture may be considered under three heads: (*a*) direct violence, (*b*) indirect violence, and (*c*) muscular action. **Causes of fracture.**

(*a*) In direct violence the fracture occurs at the spot where the violence is applied: for example, a man receives a kick on his shin, and the bone is broken at this spot. **Direct violence.**

(*b*) In indirect violence the bone breaks at its weakest point, the force being reflected along the bone. **Indirect violence.** A good example of this is a fracture of the clavicle as a result of a fall upon the shoulder.

(*c*) The best example of a fracture due to muscular action is to be seen in the patella, which we have described as being embedded in a tendon (extensor tendon) that **Muscular action.**

represents those muscles on the front of the thigh which straighten the leg. The muscles being suddenly put into action with considerable force in such a case, the bone snaps before the patient falls to the ground.

Predisposing causes. As age advances the bones tend to become more brittle, thereby rendering them more liable to be broken than they would otherwise be. This also occurs in certain diseases.

Symptoms of fracture. The chief symptoms of fracture are crepitus, deformity, abnormally free movement, pain, swelling, and loss of power.

Crepitus. (1) Crepitus is sometimes quite apparent as a rough grating noise when the fragments are moved one on the other. When it is obvious that a fracture is present, it is usually unnecessary to attempt to elicit it, as the manipulations often cause severe pain. On the other hand, it may be difficult or impossible to obtain crepitus, and when a fracture is impacted it is absent. True crepitus can nearly always be distinguished from the so-called false crepitus, which arises from other causes, and is a much finer crackling than is bony crepitus.

Deformity. (2) Deformity is usually present, but by no means invariably so. The outline of the limb, when compared with its fellow, is found to be altered, and the fragments may overlap, when more or less shortening results; or they may be separated by a considerable interval.

Abnormally free movement. (3) Abnormally free movement, when present, is a valuable sign. Here, again, we must be careful to abstain from all unnecessary manipulation. Children's bones are very elastic, and on this account we may be deceived into diagnosing a fracture where none exists.

Pain. (4) Pain is generally localised to the site of the fracture. Sometimes it is very slight; more often it is well marked.

Swelling. (5) Swelling may be present, but this is always an uncertain sign.

Loss of power. (6) Loss of power is usually complete, but in some fractures it may be absent. It is by no means uncommon for a man to walk into hospital with a broken leg under the impression that the injury is nothing more than a severe contusion. The author recollects more than one such case.

It will be seen, then, that it is generally necessary to take into account several of the symptoms in the diagnosis of the fracture, crepitus, when present, being the most valuable sign.

Broken bones, in order to unite satisfactorily, require accurate apposition of the fragments.

Callus. A material called callus, which may be likened to a sort of cement, is thrown out between and around the fragments, which thus become welded together.

Management of a fracture. The management of a fracture includes its reduction and retention, and these should be undertaken as soon as possible. **Nurse's duties.** The duty of the nurse when brought into contact with a fracture, in the absence of a doctor, is to render first aid to the patient. She should remove the clothes with the greatest care, firstly from the sound limb, if necessary cutting up the garments to give free access. The injured limb must be well supported, for a simple fracture may otherwise be converted into a compound by one of the fragments being driven through the skin. The broken limb is kept at rest by means of sand-bags or splints until the doctor's arrival. **First aid.** Under certain circumstances, where proper appliances are not at hand, splints may be extemporised out of umbrellas, walking-sticks, or from rough pieces of wood. The same applies to stretchers and stretcher-poles, which may be easily made from a board or gate, the stretcher-cloth being supplied by coats, blankets, etc. In the case of the upper limb slings can easily be extemporised from handkerchiefs.

To reduce a fracture we employ extension; but in cases of impacted fracture we often prefer to leave the fracture unreduced.

All that we can attempt to do is to lay down some general principles; for the satisfactory treatment of fractures requires experience, and often demands much resource.

An anæsthetic may be required for reduction where there is much muscular spasm; especially does this apply to the lower limb. Confinement to bed is almost always necessary in the case of fractures of the lower limb for a varying period.

Compound fractures. In compound fracture there is the additional treatment required for the wound, which is generally a severe one. When the bones and soft parts are severely crushed, amputation is often necessary. In the case of a small punctured wound communicating with a fracture, we may seal the wound with a film of cotton-wool and collodion or friar's balsam. Having set the fracture, the wound is treated on the principles already laid down (see chapter xii.).

Before reducing or, as it is commonly termed, setting a fracture, all splints and other requisites must be in readiness. It may be necessary at first to lay the injured limb on a pillow or between sand-bags, to allow of the subsidence of the swelling. Bandages must be applied lightly over the site of fracture. Before the limb is fixed in position care is taken to see that there is no deformity remaining.

Fracture-mattress.

FIG. 24.—FRACTURE-MATTRESS.
a. To slip out for use of bed-pan.

A fracture-mattress (fig. 24) is very convenient, as it allows of the introduction and withdrawal of the bed-pan with the minimum of movement on the part of the patient.

Fracture-bed.

It is also good to have a wooden framework below the mattress to ensure an unyielding support.

Position of fractured limb.

The limb must be placed in the most comfortable position. In a fracture of the leg the lower limb is usually slung in a Salter's cradle.

Attention to the back.

The back must be carefully attended to, especially in elderly people, where long confinement to bed is necessary. It is advisable to give an aperient at the outset, and light diet for the first few days is indicated.

An increase of pain, a rise of temperature, and especially swelling and a feeling of numbness in the parts below the fracture, may call for a loosening of the bandages or an examination of the fracture. Where these symptoms exist, the nurse must report to the doctor. Often opium or morphia may be required the first night to procure rest and relieve pain.

In course of time some material, such as plaster of Paris, or gum and chalk, may be applied till firm union has occurred, to take the place of splints. Their application will be considered elsewhere (see chapter xx.).

Ununited fracture. A fracture may from various causes fail to unite, and then further measures, such as resetting or wiring of the fragments, will usually be required.

Results of fracture. As a result of fracture, wasting of the muscles or stiffness of the neighbouring joints is often felt; and it is in such cases that massage, electricity, and carefully carried out passive movements of the limb are so valuable in restoring the tissues to their normal state. Various stimulating liniments, such as the turpentine or compound camphor liniments, may be used with the same object. It is especially where fractures involve a joint, such as the elbow, that early passive movement is so important to prevent a stiff joint, and the nurse may be called upon to undertake such movements. **Breaking down of adhesions.** It may be necessary to break down adhesions which have formed in a joint as a result of fracture extending into it; for this an anæsthetic is often required, and it may have to be repeated several times before perfect joint movement is re-established.

Fractures considered individually. It will now be necessary to pass some of the commoner fractures in review, especially as regards their management.

Fracture of the vault and base of the skull. Fracture of the skull may be simple or compound, and may affect the vault or the floor (base). Fracture of the vault of the skull usually results from a severe injury, either a blow or a fall; such a blow or fall may not only fracture the vault, but may spread to the base of the skull, or may fracture the base alone.

Depressed fracture of the vault. Of the various forms of fracture of the vault there is only one to which we need specially refer—namely, the depressed fracture; here one or more fragments are driven inwards below the surface, and, by pressing on the brain and membranes, set up symptoms which will demand speedy surgical interference.

Symptoms. The symptoms of fracture of the vault depend on injury to the brain and its membranes. The brain may be shaken (concussion) or compressed; hæmorrhage may occur from injury of the blood-vessels supplying it, and inflammation may also ensue sooner or later.

The diagnosis often presents difficulties, but where there

is any doubt as to the existence of a fracture the case is always treated as such.

Fracture of the base of the skull. Fracture of the base of the skull may occur at any part, and the symptoms will vary accordingly. In addition to blows on the vault of the skull, this accident may occur from a fall on the feet or buttocks, when the force is transmitted upwards along the spine to the occipital bone. The middle part of the base of the skull is the commonest site of fracture. An important symptom in these cases is the discharge of cerebro-spinal fluid or of blood from the nostrils or ears. In the case of discharge of the cerebro-spinal fluid from the ear, the fracture, by involving the hole in the temporal bone by which the auditory nerve leaves the skull, causes a rent of the dura-mater at this spot; hence the fluid finds its way into the ear, and by a tear in the drum of the ear escapes externally.

Management of fracture of the skull. In the management of fracture of the skull, whether it involve the vault or the base, there are certain principles to be observed. The patient should be kept absolutely quiet in bed in a darkened room. Ice should be applied by means of an ice-bag to the head, which may be shaven in serious cases. The bowels should be freely opened by calomel or one or two drops of croton oil placed on the tongue. Slop diet is ordered at any rate for several days. Where there is a compound fracture every care must be taken to prevent the wound becoming septic. It should always be remembered that in those cases in which the drum of the ear is torn, with the escape of cerebro-spinal fluid, the fracture is a compound one. Surgical interference may be called for, either to enlarge the wound or to elevate a depressed fragment of bone, or, where this cannot be effected, to trephine. The patient will at first require constant watching on the part of the nurse, who must pay special attention to the pulse and to his general condition. Stimulants are usually contra-indicated.

Fracture of the lower jaw. Fracture of the lower jaw may occur in one or more places as the result of a blow or kick. The appearance of the patient is often characteristic. Crepitus can usually be obtained with ease. The teeth may be loosened or knocked out, and there may be bleeding from laceration of the gums. Pain is complained of on mastication. Our

object in treating this fracture is to fix the lower to the upper jaw, so as to keep the parts at absolute rest. The commonest way of doing this is by means of the four-tailed bandage (fig. 25) or by a piece of poroplastic felt in addition, moulded to the jaw. The nurse will best learn this from seeing it done; and, indeed, this holds good for the application of all bandages and splints, which cannot be learnt from a book.

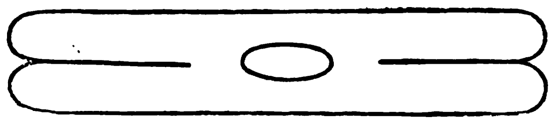


FIG. 25.—FOUR-TAILED BANDAGE, WITH SLIT FOR CHIN.

The patient must be fed upon slops, which are introduced into the mouth behind the teeth or through the space left by the loss of a tooth. The bandage is kept in position for four weeks. The mouth should be washed out daily with Condy's fluid or boracic lotion.

Fracture of the ribs.

Fracture of the ribs is often the result of a severe crush, as when a man is squeezed against the wall, but it sometimes occurs from a severe blow or kick. The accident may be a very serious one, inasmuch as one of the fragments may wound the pleura or lung. The middle ribs are those most frequently broken. There is pain, generally referred to the seat of injury, and crepitus may be elicited on making pressure over the site of fracture; great care, however, is used in trying to obtain crepitus, or serious injury may be produced. The side must be kept absolutely at rest, and this is best done by strapping the chest-wall from the sternum in front to the middle line of the back behind. Over this strapping is placed a flannel bandage—a fold of which, pinned in front and behind to form a brace to pass over the shoulders, prevents the bandage from slipping downwards. The patient is best kept in bed for a few days, and any complications, such as pneumonia, pleurisy, and pneumothorax (air in the pleural cavity), must be watched for and treated accordingly. If the patient be advanced in years, stimulants will usually be required; and when there is much pain and restlessness, opium or morphia may be called for.

Fracture of the clavicle. The clavicle is very commonly broken, from its lack of protection: the fracture most frequently occurs about the middle of the bone. In children it is common for the fracture to be incomplete, or, as it is usually called, green-stick. In running the fingers along the bone an irregularity is felt, and as a rule crepitus is easily obtained. In such an injury as this the shoulder is pulled downwards by the weight of the arm, drawing with it the outer fragment. A patient with a fractured clavicle often presents himself with the elbow of the injured side in the palm of the sound hand, in order to support the limb.

Methods of treating a fractured clavicle. There are several methods of treating a fractured clavicle. Rest in bed, with a pillow between the shoulders and the arm fixed to the side by a bandage, is the best treatment; but it is only necessary to insist on rest in bed when it is important to prevent any deformity resulting, and few people will submit to such a restriction. The principle of treatment—namely, to fix and retain the arm to the side—is the same, whichever method we adopt. **Pad and bandage.** One plan consists in placing a pad of wool in the axilla and bandaging the arm to the chest, the fingers of the hand resting on the sound shoulder. Another method is to fix the arm with strapping as recommended by Sayre. **Sayre's method.** One strip is stitched round the injured arm with the sticky side outwards, and then carried round the body from back to front to the starting-point, where it is fixed in position. The second strip is carried from the sound shoulder across the back, under the elbow, which rests in a slit cut in the plaster, and up across the front of the chest to the starting-point. A third strip may be used to retain the others in position.

Fracture of humerus. The humerus may be fractured in any of its parts, and in childhood the ends of the bone where growth takes place **Separation of epiphysis.** (epiphysis), which have not yet become firmly joined to the shaft (diaphysis), may be separated as a result of injury.

Fracture of surgical neck. Fracture of the narrow part of the humerus below the head of the bone (surgical neck) is a common accident (fig. 26). The direction of the limb is altered, and there is crepitus with abnormally free movement. Here we place a pad in the axilla, with a shield made out of poroplastic or some similar substance over the shoulder (fig. 27), and bind the arm to the chest by a broad bandage. A sling is used to

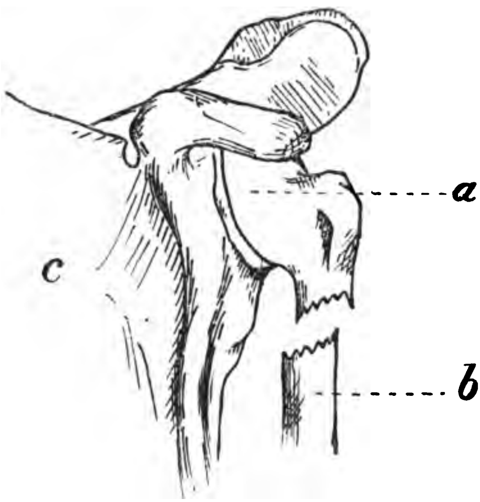


FIG. 26.—DIAGRAM TO REPRESENT FRACTURE OF THE SURGICAL NECK OF THE HUMERUS.

a. Head of humerus lying in glenoid cavity of scapula.
b. Shaft of humerus drawn inwards.
c. Scapula.

FIG. 27.—SHOULDER-CAP.

support the arm. This must be retained for from four to five weeks.

Fracture of the shaft and lower end.

In fracture of the shaft or lower end of the bone the best kind of splints are the internal and external rectangular, commanding the limb from its upper part to the fingers. These splints must be well padded. The arm is then placed in a sling.

T-shaped fracture.

A fracture which sometimes occurs at the lower end of the humerus and femur is what is known as a T-shaped fracture (fig. 28), the vertical limb of the T involving the elbow- and knee-joints respectively. In these cases there is usually much swelling, which, by obscuring the bony prominences, may render a diagnosis of the injury difficult or impossible. In such a case the limb is laid on a pillow, and lead-and-opium or other evaporating lotion applied and frequently renewed until the swelling has subsided.

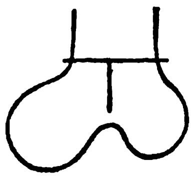


FIG. 28.

Fracture of radius and ulna.

The radius and ulna may be broken together, when each bone generally gives way at its weakest point, as happens also in the case of the tibia and fibula. But in cases of direct violence—for example, as a result of a severe blow with a stick—the bones are broken opposite each other. In this fracture broad, straight splints answer best, with little pads to fit in between the two bones to preserve the space between them (fig. 29).

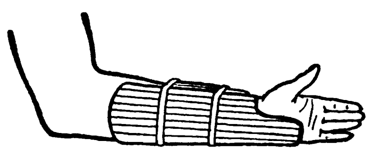


FIG. 29.—GOOCH-SPLINTS APPLIED FOR FRACTURE OF BOTH BONES OF THE FOREARM. ANTERIOR SPLINT CUT AWAY TO PREVENT PRESSURE ON THE BALL OF THE THUMB.

Colles' fracture.

The only other fracture of the upper limb which we need mention is that associated with the name of Colles, in which the lower end of the radius is broken, generally as a result of falling with the hand outspread, when the violence is applied to the ball of the thumb. In this accident a prominence is found on the back of the hand, and the deformity is so characteristic that it is seldom necessary to try to elicit crepitus. Many splints have been devised for this fracture, two of which will be found figured

on pages 219 and 220; but plain splints, broad and well padded, are quite sufficient. It is important in managing such a fracture to allow free movement of the fingers, so as to obviate stiffness. The splints must not be discarded for a month; at the end of a fortnight, however, they are generally removed, and passive movement gently employed, when they are reapplied.

Fracture of the pelvis.

Fracture of the pelvis is usually caused by a crush, as when a wheel passes over the body. On grasping the sides of the pelvis and making side-to-side movements, crepitus may sometimes be obtained. The gravity of this accident depends on the liability to injury of the organs contained in or closely related to the cavity of the pelvis. The bladder may be ruptured; the urethra is, however, the structure which is most commonly injured, the resulting tear often being followed by a permanent narrowing (stricture) of the passage, due to the contraction of its walls at the seat of injury.

The treatment consists in absolute rest in bed on the back, with a double long splint and a bandage encircling the body to keep them in position.

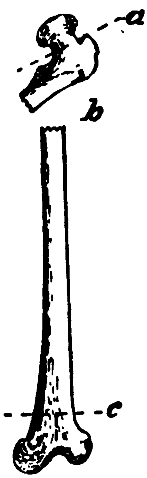


FIG. 30.—FRACTURE OF FEMUR BELOW THE TROCHANTERS (*b*).
a. Fracture of neck of femur within capsule.
c. Fracture at lower end, extending into joint (T).

Fracture of the femur.

Fracture of the femur is a very common injury, especially in old people. The bone may be broken at the neck—that is to say, the narrow part between the head and the shaft—in the course of the shaft, or at the lower end (fig. 30). We speak of fracture of the neck as intra-capsular and extra-capsular, according as the fracture occurs inside or outside the capsule of the hip-joint.

Intra-capsular fracture of neck of femur.

The intra-capsular variety is that which is usually met with in old people. It often occurs as a result of a slight accident, such as may happen from tripping on a carpet or slipping off the curbstone. This is due to the neck of

the bone becoming more brittle in the aged. The symptoms of this accident are shortening of the limb and pain at the site of fracture. The limb rolls over by its own weight, and lies on its outer side (eversion). Movement of the limb is only carried out when the diagnosis is doubtful, since it tends to prevent bony union. The fracture is sometimes impacted, when crepitus is of course absent.

FIG. 31.
LISTON'S LONG SPLINT.

In treating fracture of the neck of the femur we have to consider the age of the patient and the chances of obtaining bony union.

Management in the aged.

In the aged we can usually only expect fibrous union, and therefore such cases are only kept in bed a few days. The limb is kept at rest merely between sand-bags; or a long splint (Liston's) may be used (fig. 31), which reaches from the axilla to beyond the foot. The back must be carefully attended to, and nutrition which is often at a low ebb, promoted. Stimulants may be required. When the patient gets up, a plaster-of-Paris casing may be applied; or he may get about on crutches, with the foot slung in the loop of a bandage which is tied round the neck.

Management in younger patients.

In younger patients who can stand confinement to bed for from six to eight weeks we try to obtain bony union.

Extension.

Extension is usually necessary. This is carried out by means of strips of adhesive plaster.

The nurse must be able to prepare an extension apparatus, and must understand its application. The following method is recommended by Heath: "A strip of plaster, two inches wide, is cut long enough to reach from immediately above the knee to the sole, and up again on the opposite side of the limb, leaving a loop eight or ten inches long

below the foot. This is carefully applied to the limb; a strip of plaster or a bandage is carried over it, so as to prevent its slipping; and a piece of wood may be placed in the loop." A weight is attached to a cord, which in its turn is fixed to the wood by a knot passing through a hole in its centre. The lower fragment is thus pulled downwards by a steady and even traction. To act as a counter-extending force the end of the bed is usually raised on blocks. The long splint is then fixed in position to the leg and the body, and to the thigh itself small gooch-splints may be applied; but a stout towel or sheet, firmly fixed round the thigh and pinned to the splint, forms a simple and very efficient appliance.

McIntyre's splint.

In fractures at the lower end of the thigh the McIntyre splint is very useful. This will be described in a later chapter (see p. 220).

Treatment of fracture of femur in vertical position in young children. Method.

In young children a fractured thigh is now commonly treated in the vertical position. A couple of light splints are applied to the thigh, which is then bent to a right angle on the body, and with its fellow is suspended from the cradle or from a wooden cross-beam (fig. 32). The buttocks should be just clear of the bed. The advantages of this position are that the child can be more readily kept clean and perfect rest for the fracture is obtained. The child soon becomes accustomed to the unnatural position. For the diagnosis, and especially for the setting of a broken thigh, an anæsthetic is often necessary.

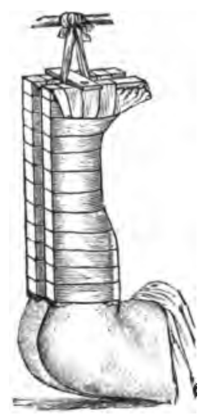


FIG. 32.—FRACTURE OF THIGH IN INFANT TREATED IN THE VERTICAL POSITION.

Fracture of the patella.

Fracture of the patella (fig. 33) usually occurs from muscular action in the manner already explained when the bone is broken transversely; the fracture may, however, be vertical when it results from direct violence, as a fall or a kick on the knee. There is usually much swelling, and the

serum or blood effused may prevent the apposition of the fragments.

The principle of treatment is to bring and retain the fragments in apposition, and several plans have been recommended from time to time to accomplish this object. The leg is kept straight, and the swelling reduced by lead-and-opium lotion or ice. Probably a plaster-of-Paris splint, enclosing both the leg and the thigh, with a few days' rest in bed, after which the patient is able to get about with crutches, gives the best results. A knee-cap will have to be worn subsequently for a year, and the limb used with care. Lately the fragments have been wired together with good results as soon after the injury as possible.

Fracture of the tibia and fibula. The tibia and fibula may be broken together, either at the same spot or in different situations, when the fibula gives way at a spot rather higher than the tibia. There is often in these cases well-marked deformity, with crepitus; but there may be, especially when only one bone is broken, little or no evidence of fracture.

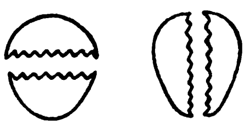


FIG. 33.
Transverse. Vertical.
FRACTURE OF PATELLA.

Pott's fracture. A very common fracture is that known as Pott's, where the fibula is broken at its lower end. This generally results from a severe twist or wrench of the foot.

After reducing these fractures we apply some form of splint, two of which we shall mention: (1) the box-splint, and (2) Cline's splints.

Box-splint. The box-splint consists of a long back-splint reaching a little way above the knee, with a foot-piece attached. The leg is gently placed on this splint, to which it is fixed by strapping and bandages. The heel is prevented from touching the splint by a pad placed just above the heel. Side-splints are then applied, and fixed in position with a couple of straps and buckles. These splints must be evenly and well padded, and the hollows in the box filled in with wool. Finally, the limb may be placed between sand-bags or slung in a cradle. The bandage is not placed immediately over the site of fracture, which is best left uncovered for inspection.

Cline's splints. Cline's splints are a couple of side-splints, figured and

described on page 220. The leg is bent and placed on its outer side.

Inflammation of bone. Inflammation commences in a long bone either (1) in the periosteum (periostitis) or (2) in the interior of the bone, the medullary cavity (osteomyelitis). The inflammatory process may be acute or chronic, and may subside without suppuration or may terminate in abscess formation and necrosis. The usual signs of inflammation are present in greater or less degree, depending on the cause and character of the inflammation. Pain is usually worse at night. Some forms of bone inflammation present very severe symptoms, and may even terminate fatally. In such cases the diagnosis may present great difficulties, especially when there is no wound or other sign to direct attention to the bones as an explanation of the symptoms.

Management. Little can be said regarding management, as each case is treated according to the actual conditions present. In acute cases complete rest, elevation of the limb, and fomentations are called for. When a piece of bone dies (necrosis), it is removed as soon as it has become separated. Abscesses, whether under the periosteum or in the cavity of the bone, require to be evacuated. In severe cases the strength must be maintained by a nutritious diet, and usually alcohol is prescribed.

CHAPTER XVI.

INJURIES AND DISEASES OF JOINTS.

In this chapter we shall deal with the commoner injuries of joints—namely, sprains and dislocations; and also with certain diseases—namely, simple inflammation and tubercular disease.

I. *Injuries.*

Sprains. (1) Sprains. The joints most commonly affected by sprain are the wrist, the knee, and the ankle. Sprains result from a severe twist or wrench, which unduly stretches and sometimes even tears the ligaments of the joint. The pain is severe, and swelling soon supervenes, and involves both the joint itself and the tissues around it. From the swelling present it may be difficult to say whether or no a fracture exists, but in cases of doubt the injury should be treated as one. This difficulty is very likely to occur in connection with the ankle-joint.

Management. The joint is placed upon a splint, and lead-and-opium lotion applied on lint, or ice may be used. Some prefer heat,—either dry, as hot cotton-wool; or moist, in the form of fomentations. Stiffness must, if possible, be avoided by not keeping the joint too long at rest. Gentle passive movement should rarely be delayed beyond the tenth day. When adhesions have formed, they must be broken down, as we have seen. The liability, especially when there is a bad family history, or where the subject is otherwise predisposed, to tubercular disease of the joint should be borne in mind. Massage, when the inflammation has subsided, is often of much value.

Dislocations. (2) Dislocations. These are the result of injury and of muscular action, acting in the way we have already seen (see Fractures, chapter xv.). The ends of the bones which form the joint become forcibly separated. Some joints, from their

shape, are more liable to be dislocated than others. A dislocation may, like a fracture, be simple or compound.

Signs. The most characteristic signs of a dislocation are: (1) an alteration in the length and shape of the limb; (2) loss of power in the limb or part of the limb affected; (3) change of position of the end of the bone—for example, where the head of the humerus comes to occupy the arm-pit. There is generally considerable swelling, which may be due to the synovial fluid or blood effused. This swelling often masks the signs of dislocation. The effused blood may give rise to a feeling somewhat resembling crepitus; it is, however, a much finer sound than bony crepitus, as we have already seen. It must be remembered that dislocation and fracture may exist together.

Early reduction of a dislocation. It is necessary to reduce a dislocation as soon as possible, for several reasons: (1) the swelling, which rapidly supervenes, may render a diagnosis impossible; (2) the displaced bone may, by the pressure it exerts in its new position, do damage to the tissues; (3) a dislocation which remains unreduced may cause a false or stiff joint to result; and (4) there is greater difficulty in reducing one of long standing. An anæsthetic is often required for reduction to overcome the muscular spasm.

Methods of reduction. Reduction is affected by some form of manipulative movement, according to the joint affected; or by extension, which, however, is reserved for those cases in which manipulation fails. In such a joint as the shoulder or hip we aim at so moving the limb as to cause the head of the humerus or femur to pass back into the glenoid cavity or acetabulum through the torn capsule.

After-treatment. After reduction the joint is kept at complete rest, to allow of the healing of the capsule and the recovery of the bruised or torn tissues. At the same time stiffness must be prevented by gentle passive movements begun as soon as circumstances permit. Massage and sometimes the electric current are valuable to restore the often wasted muscles in the neighbourhood of the injured joint. In cases of compound dislocation, after reduction has been effected, the wound must be treated on antiseptic principles. The shoulder is more commonly dislocated than the hip-joint, as the glenoid cavity is more shallow than the acetabulum.

Dislocation of shoulder. On comparing a dislocated shoulder with the sound side the roundness is seen to be done away with, and the arm is directed away from the side.

Dislocation of elbow. A dislocated elbow most commonly occurs as a result of a fall on the hand, and usually affects the radius and ulna, which are generally driven backwards, the lower end of the humerus forming a projection in front of the joint.

Dislocation of the hip. In dislocation of the hip-joint the head of the femur may lodge in various sites in relation to the haunch-bone: the commonest variety of this accident is the backward dislocation. In such a case the limb is flexed and drawn over towards its fellow, and shortening is more or less marked. The manipulations required for the reduction of these and other dislocations can best be understood by seeing such dislocations reduced or by watching these movements being carried out on the skeleton.

II. *Diseases.*

Simple inflammation. (1) Simple inflammation of a joint affects the synovial membrane; hence it is usually called synovitis. When all the structures of a joint become diseased, the condition is known as arthritis (Gk. *arthron*, a joint). Many cases of arthritis commence as synovitis, but at present we are speaking of synovitis pure and simple.

Cause. It arises most commonly from some injury, such as a sprain or blow—occasionally from a fracture near a joint. It may, however, occur apart from injury, as in the various forms of rheumatism.

Acute synovitis of knee-joint. Symptoms. Let us take as an example acute synovitis of the knee-joint. The knee is hot and swollen, and the joint may be likened to a horse-shoe in shape. Fluctuation can generally be obtained. There is considerable pain, and the knee is kept flexed, as this is the most comfortable position. The temperature is somewhat raised.

Terminations. This condition generally lasts a few days, when it may subside or develop into a chronic synovitis, with perhaps tubercular disease, in a patient predisposed to tuberculosis. Lastly, suppuration may ensue, when the bone-ends and cartilage become affected, and the joint is transformed into an abscess-cavity. The pus, if not evacuated, discharges by one or more sinuses, and a stiff joint results.

Management. In the management of acute synovitis the part must be kept at rest on a splint, and, in cases where the lower limbs

are affected, the patient must be confined to bed. We desire to place the limb in the position which would prove most useful, should a stiff joint eventually result. In the case of the knee the straight position is adopted; on the other hand, in dealing with the elbow the arm must be kept at right angles.

Local applications. Usually soothing applications are called for, such as lead-and-opium lotion, which may be sprinkled on hot fomentations. Belladonna and glycerine painted over the joint is a remedy which often gives good results. In from a week to ten days' time we begin passive movement.

Chronic synovitis. In chronic synovitis the joint presents the same signs as in the acute variety, but heat and pain are absent. Here blistering or other forms of counter-irritation must be resorted to. Scott's dressing is valuable. Local rest must be enjoined; but the patient can generally soon get about, with a suitable apparatus, such as a sling, for the upper limb, and some form of splint for the lower. Massage and passive movement must be carried out to prevent or remove adhesions.

Tubercular joint disease (2) Tubercular joint disease is extremely common. Probably from 80 to 90 per cent. of diseases of joints are tubercular. Such a joint may, as already explained, develop out of a simple synovitis, or the mischief may start originally from the infection of the joint by the organism of tuberculosis (Koch's tubercle bacillus). The disease may commence in the synovial membrane or in the bone-ends. Its onset is very gradual. Certain joints are more liable to be affected than others. The hip is probably the joint most commonly attacked, while the shoulder is most exempt; but all the joints of the limbs are liable to be affected.

Early symptoms. The first symptoms complained of usually are slight stiffness in the joint, generally accompanied with pain on movement, which is at first also slight and relieved by rest. **Referred pain.** We must note that pain is often referred to other parts, as is commonly seen in hip disease, where it is often complained of in the knee. There is also a little heat in the joint, which can be detected when the two sides are compared together. **Wasting of muscles, specially of the extensors.** The muscles are often wasted at an early stage of the disease, those muscles which extend the limb suffering more than the flexor group. Movement is

impaired. A very characteristic appearance seen in such a joint as the knee, when affected with tubercular disease, is a pale white swelling; hence the disease is sometimes known as white swelling. Sooner or later suppuration sets in, and a chronic abscess forms, which, on bursting, leaves one or more sinuses leading down to the joint. If treatment be adopted sufficiently early, the stage of abscess formation may not be reached, the symptoms gradually subsiding. As the disease advances the health gradually becomes impaired, and in the later stages all the symptoms of hectic fever may be present.

White swelling.

Management.

The management of these cases is directed towards improving the constitution and arresting the disease in its earlier stages. In the later stages, as a rule, little can be done to procure a useful joint.

Constitutional measures.

Under the head of constitutional measures we include a generous and strengthening diet, and plenty of fresh air and sunlight, as far as these can be obtained. We try to keep the health at as high a level as possible. Cod-liver oil is our most valuable medicine; indeed, it may be looked on almost as a food in such cases as these. It may be given by itself, or combined with Parrish's food or maltine.

Local treatment.

As regards local treatment rest must be placed first. In the case of the lower limb confinement to bed will usually be necessary until the more acute symptoms have passed off and the deformity has been overcome. In hip cases extension by weight and pulley is generally carried out during this time. Later on the patient is allowed to get about on crutches, wearing some form of apparatus to maintain the joint at rest.

The splints devised by Thomas for the hip and knee respectively, which will be found described and figured in chapter xx., are universally used in tubercular disease of these joints, and give admirable results. Their simplicity adds to their value. The splint adopted will require to be worn often for a very long time, at any rate for some months after the disease has been arrested.

When suppuration has supervened, the joint has often to be opened and drained. In cases of long standing, with long-continued suppuration, amputation may be necessary to save life; but this is far less frequently required

than formerly. Probably the course adopted most generally at the present time in suitable cases is to open the joint and thoroughly remove the diseased tissue, interfering with the ends of the bones as little as possible, so as not to hinder their growth and the development of the limb. Excision of diseased joints is, however, still performed in many instances. Reference is made to this operation in chapter xix.

In tubercular disease of the ankle-joint Syme's amputation of the foot or a modification thereof (see chapter xix.) is the usual procedure.

CHAPTER XVII.

THE COMMONER AFFECTIONS OF THE EYES, AND THEIR MANAGEMENT.

THE nurse will probably be often brought into contact with injuries and diseases of the eyes, and it is therefore advisable for her to know something about such cases.

Conjunctivitis. Conjunctivitis, or inflammation of the conjunctiva, is a disease which occurs in several forms, and is very common in our country. It is also known as ophthalmia (Gk. *ophthalmos*, an eye).

Purulent ophthalmia. (1) Purulent ophthalmia occurs both in the new-born child and in the adult. This is the form which is so highly contagious, and which is apt to spread with great rapidity in schools, barracks, crowded dwellings, and even hospitals, unless due precautions are taken. Probably the use of a common towel accounts for many outbreaks of this disease; hence the importance of the utmost cleanliness and every care in the management of this variety of conjunctivitis to prevent its spreading. All those suffering from purulent ophthalmia must be isolated; and not only this, but all cases under the same roof presenting conjunctivitis in any form, for such cases are very liable to become purulent.

Symptoms. The symptoms of this disease are a feeling as of grit in the eyes, which is soon followed by severe pain. The eyelids become much swollen and very red. The discharge is thick and yellowish in colour, and is generally very copious.

Management. Isolation. In the management of these cases, besides the measures we undertake to prevent the spread of the disease, we try to save the other eye, when only one eye is affected, by covering it up with absorbent cotton-wool made into a pad. Care must be taken to allow the discharge to escape freely from the eye, and not to become pent up, or else by its

pressure it will damage the cornea. We must keep the eyes constantly bathed with warm perchloride of mercury lotion (1-5000). Once a day the lids must be carefully separated, and nitrate of silver (lunar-caustic) or blue-stone applied in the solid form to their inner surfaces; this should be followed by bathing with the lotion. A little carbolised vaseline or an ointment containing iodoform may be used to smear over the lids. The management of these cases will require much patience and perseverance on the part of the nurse. It should be remembered that the disease is a serious one, from the complications which so often ensue. Ulceration of the cornea is by no means uncommon; and this may extend through the whole thickness of the cornea, so that the lens may come to lie against the cornea, when a form of cataract results (fig. 34). **Complications.**

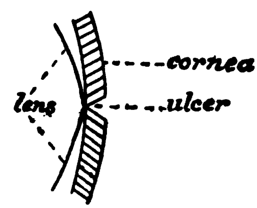


FIG. 34.—PERFORATING ULCER OF CORNEA, WITH LENS PRESENTING IN THE FLOOR OF THE ULCER.

Constitutional symptoms

There is often great headache and sleeplessness, with general depression, which must be treated by opium or other sedatives. The bowels should be freely opened.

Purulent ophthalmia in the new-born.

A word about this disease in the new-born. It is a very common cause of blindness, from neglect of treatment. The child's eyes after birth should be carefully washed; and if any signs of purulent discharge develop, perchloride lotion of the strength mentioned must be regularly used and medical advice at once obtained.

Catarrhal conjunctivitis. Causes.

(2) Catarrhal conjunctivitis is the form so commonly seen and known as cold in the eye. It may arise from a draught or from a foreign body in the eye, and usually comes on at the commencement of measles.

Symptoms and signs.

The blood-vessels become more or less prominent, giving to the eye a blood-shot appearance. There is redness of the eyelids, which are usually glued together in the morning by a sticky secretion, which is sometimes very profuse. There is usually a stinging kind of pain in the eye and intolerance of light. This affection may occur in all degrees of severity, and there may be other diseases present, such as inflammation of the cornea or iris.

Contagious form.

It often occurs in a contagious form, when the measures we have referred to must be strictly enforced to prevent its spread.

Detection and removal of a foreign body.

If due to a foreign body, the source of irritation must be removed. This is done by turning outwards the lids; the upper lid is turned out by directing the patient to look downwards, and gently drawing down the lid and rolling it outwards on itself, when its inner surface is exposed. Any foreign body under the lids can thus be seen and removed.

Management.

The lotions commonly used in catarrhal conjunctivitis are sulphate of zinc, alum, and boracic acid. Cold tea, from the presence of the tannin it contains, is a useful remedy, and one usually at hand. The lids should be carefully bathed in the morning with a soft sponge or cotton-wool, and twice a day anointed with some simple ointment.

Severer forms.

In severer cases lunar-caustic or blue-stone may be required. A shade is generally sufficient to protect the eyes from the light, and complete rest for them must be enjoined.

Granular lids.

(3) Granular conjunctivitis, commonly known as granular lids, consists in the formation of little granules on the inner surfaces of the lids, which are not unlike small sago-grains. They cause much irritation both to the conjunctiva and to the cornea, often setting up a form of inflammation in the latter, known as pannus, where the cornea, which is normally devoid of blood-vessels, becomes more or less infiltrated with loops of vessels. This form of conjunctivitis is contagious, but not so highly so as the two previous varieties.

Pannus.

Symptoms and appearance.

On turning out the lids these little granules are seen. A gritty feeling in the eyes is usually complained of. The lids are not uncommonly turned outwards (ectropion) and much thickened.

Management: general and local.

In managing these cases attention must be paid to healthy surroundings and good food, as the disease is favoured by bad hygienic conditions. Tonics, such as quinine, iron, and sometimes cod-liver oil, are useful. Locally we use warm mild lotion, such as those we have already mentioned. Blue-stone may be required, but this and like remedies must be cautiously applied to the granules.

Phlyctenular conjunctivitis.

(4) Phlyctenular conjunctivitis is the variety so commonly seen in under-fed and unhealthy children, especially when living in crowded and badly ventilated houses. It is known

also as strumous conjunctivitis, on account of its frequency in this type of constitution.

Appearance. The conjunctiva which covers the eyeball is affected at its inner or outer side by a yellowish pustule, which commences as a vesicle and eventually becomes hard. The cornea may become involved (phlyctenular corneitis).

Symptoms. The symptoms, which are usually slight, consist in some watering of the eye, with sometimes dislike of strong light, which is, however, much increased when the cornea becomes involved.

Management. Here the treatment must be largely constitutional—healthy surroundings, good nourishing diet, fresh air, and tonics, especially cod-liver oil, being indicated. The most valuable local remedy is undoubtedly the well-known yellow ointment, (**Yellow ointment.**) which consists of the yellow oxide of mercury (from two to four grains) in vaseline (one ounce). A quantity of this (about the size of a pea) should be introduced into the eye night and morning, the lids being gently rubbed one over the other to allow of the diffusion of the ointment over the conjunctiva. Boracic acid or alum lotion should also be used three or four times a day. The patient must not read, and a shade must be worn.

In speaking of inflammation of the conjunctiva we have referred to two varieties of inflammation of the cornea—namely, pannus and phlyctenular corneitis. The only other affection of the cornea to which we need refer is ulcer, (**Corneal ulcer.**) which is so commonly seen either as a result of injury or previous disease of the cornea. We must remember that behind the cornea lies the lens, separated from it by a cavity containing a watery fluid, this cavity being known as the anterior aqueous chamber. (**Anterior aqueous chamber of the eye.**) When an ulcer extends through the substance of the cornea (perforating ulcer), (**Perforating ulcer.**) the aqueous fluid tends to escape, and the iris and sometimes the lens are pushed forward more or less completely into the wound; in fact, the aqueous chamber becomes obliterated.

Variations in size, shape, and depth of corneal ulcers. Ulcers of the cornea vary in size, shape, and depth. Sometimes an ulcer is so slight that by the unaided eye it may be impossible to detect it. (**Symptoms.**) The chief symptoms complained of are pain, great intolerance of light, and watering of the eyes. There is often spasm of the lids, and the eyes are usually kept tightly closed. The ulcer may rapidly heal, or may spread in area and depth. The appearance

presented by ulcers is that of a greyish-white opaque speck on a transparent background.

Result. As a result a scar is not uncommonly left on the cornea, especially when the ulcer has been a deep one. This scar, if over the pupil, may interfere more or less completely with vision.

Hypopyon. A by no means uncommon complication of deep corneal ulcers is the presence of pus in the anterior chamber of the eye, which appears as a white line at the lower part of the chamber, where the pus collects from gravitation. This condition is known as hypopyon (fig. 35). The pus lies free in this chamber, and changes its position according to the position of the head. This complication is usually seen in injuries of the cornea, more especially in elderly people.

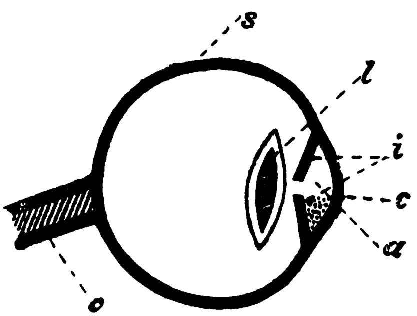


FIG. 35.—DIAGRAM TO ILLUSTRATE HYPOPYON.

s. Sclerotic. *c.* Cornea.
l. Lens in capsule. *a.* Anterior chamber, with pus in its lower part.
i. Iris. *o.* Optic nerve.

Management. The management of corneal ulcers is directed towards the relief of pain, the improvement of the general health, and to keeping the eyes at absolute rest, and thus favouring the healing process. **Atropine and eserine drops.** Atropine is of great value to relieve pain and to dilate the pupil, but eserine is often found to give better results; it not only stimulates the ulcer, but it contracts the pupil, and thus draws away the iris from the ulcer. Fomentations afford much comfort to the patient in the early stages; they should be changed frequently. They may consist of plain hot water or poppy-heads. A pad of hot dry wool is often useful. The atropine or eserine should be dropped into the eye as often as ordered by the doctor, after bathing the eye. Where there is severe pain, morphia, administered hypodermically, may be required. To stimulate the ulcer, when the acute symptoms have

passed away, yellow ointment should be applied in the way already indicated. Atropine may be combined with the yellow ointment, to relieve the pain sometimes produced by it. A blister or seton behind the corresponding ear is often useful as a counter-irritant in chronic cases. Improvement of the general health must be brought about by tonics such as we have mentioned, good food, and attention to the surroundings of the patient.

Yellow ointment.

Counter-irritation.

Improvement of general health.

Pus in the anterior chamber frequently becomes absorbed under such treatment, but sometimes it may require to be evacuated. This is a very delicate operation, as there is a danger of the iris and the lens being wounded, with consequent iritis and cataract.

Evacuation of pus from anterior chamber.

Burns of the eyes are by no means infrequent. A common cause of these injuries is a sudden draught which forces the flame from a furnace door when stoking is being carried on. The flame catches the man's face, and may singe the hair and injure to a greater or less extent the eyelids and cornea.

Burns.

The eyes must be carefully bathed with warm water, and castor-oil drops instilled into them. The lids should be smeared either with the oil or a little vaseline, to prevent adhesion taking place either to each other or to the globe of the eye. A light pad and bandage should then be applied. The bathing may be carried out several times daily, followed by the drops.

Management.

The iris is liable to become inflamed as a result of injury arising from wounds or from operations on the eyes, especially for cataract. But iritis also occurs in connection with both rheumatism and syphilis. It is to the iris that we owe the various different colours of eyes, dark eyes resulting from the presence of pigment in the iris. In the centre of it is the pupil, which we have seen to vary in size according to the condition of the iris. In health the pupil is constantly changing; on exposure of the eye to light the pupil contracts, and on shutting out the light dilatation results. This can easily be seen if the patient stands with his back to the window, and the eye is alternately shaded and exposed to the light. In iritis these movements of the pupil are always diminished, and may be altogether lost.

Inflammation of the iris.

Causes.

Changes in size of the pupil in health.

The iris, when inflamed, becomes not only deficient in its movements, but also loses to some extent its usual colour,

Appearance of the iris when inflamed.

Symptoms and signs.

becoming more or less muddy in appearance. There is usually severe pain, often referred to the temples, and also dislike of light. As a result of the inflammation a sticky fluid may be poured out, and this tends to bind down the iris more or less completely to the lens, which lies immediately behind it. This causes irregularity of the pupil, as the part of the iris which becomes adherent fails to move with the rest of it. This may be well seen if a drop of atropine is introduced into the eye, when the pupil dilates only slowly and irregularly. It is these adhesions of the iris we are so anxious to prevent, as they are, by their constant traction on the rest of the iris, a source of irritation, and tend to cause a recurrence of the inflammation.

Effect of adhesions of the iris on the pupil.

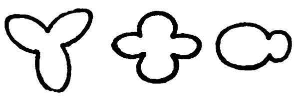
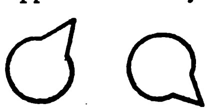


FIG. 36.—SHAPES OF THE PUPIL AS SOMETIMES SEEN AFTER IRITIS WITH ADHESIONS.

Management of iritis.

Hence the most important point in the management of iritis is to keep the pupil well dilated by the free use of atropine (from two to four grains in an ounce of water) dropped into the eye. It acts beneficially also by relieving the pain. If, when the sticky material is being poured out, the pupil is well dilated, there is much less chance of adhesions being produced. Again, if they have resulted, the free use of atropine may cause them to give way. The application of hot dry pads to the eyes gives relief. Opium may be necessary if the pain is severe. The eyes must be shaded, and even if only one is affected both must be kept at absolute rest. The bowels should be freely moved. If the adhesions are numerous and vision is interfered with, iridectomy may be required. In this operation part of the iris is removed, either to increase the size of the pupil, to make an artificial one, or to relieve pressure on the eyeball. Usually the upper part of the iris is taken away, the resulting appearance being somewhat as shown in fig. 37.

The prevention of adhesions.



(1) (2)

FIG. 37.—SHAPES OF PUPIL AFTER IRIDECTOMY.

(1) Upwards, (2) Downwards.

Iridectomy.

Cataract.

We must now say a few words about the condition known as cataract. This consists in a loss of transparency of the

substance of the crystalline lens which occurs under many conditions and in various degrees. In most cases we know no cause for the change; but it is much commoner in elderly people, especially those over sixty years of age. It not infrequently results from injury to the lens, produced either during an operation on the eye, or by accidents, such as a blow or foreign body. **Cause.**

Our remarks will refer to the common cataract (hard, senile, or nuclear) occurring in the old. The chief complaint is gradually failing sight. The patient finds he cannot obtain glasses to suit him. As the cataract becomes more and more opaque it is said to ripen, and the sight becomes worse; but unless another disease be present the patient can always distinguish light from darkness. When ripe, it presents a milky-white appearance. Cataracts are now usually treated by extraction of the lens—an operation which we shall briefly describe. **Common or senile cataract. Symptoms and appearance.**

It is well for the patient to be confined to bed for a day previous to the operation, and the night before a purgative may be administered with advantage. Shortly before operation the eye must be thoroughly bathed with perchloride of mercury lotion (1-5000), and then a drop of a solution of cocaine (4 per cent.) is instilled into the eye at intervals of two minutes, until the cornea becomes insensitive. **Cataract extraction. Preliminaries.**

The patient, who lies on his back, with his head supported on firm pillows, is directed to fix his gaze on some object, such as a lighted taper or candle, held above his head by the nurse. The surgeon takes up his position behind the head of the bed. A speculum is now introduced between the lids to separate them; and while the conjunctiva is fixed with a pair of forceps (fixation-forceps), the cataract-knife, which has a long, narrow, sharp-pointed blade, is entered close to the junction of the sclerotic and cornea on one side, and passed through the anterior chamber of the eye to a corresponding point on the other side, where it emerges. It is now made to cut its way upwards or downwards, according as an upper or lower flap is made. The incision completed, the capsule of the lens is gently torn through with a sharp needle, when the lens, springing forwards, presents in the wound, through which it is carefully removed. **Position of patient and surgeon. Introduction of the speculum. Incision. Opening of capsule of lens. Delivery of lens.**

The eyes are now both closed, and a bandage applied—a

After-treatment. good method of closing the eyes is to use isinglass plaster, cut in the form of a dumb-bell, the broad parts covering the upper and lower eyelids. The patient keeps the eyes gently closed, and is directed not to squeeze them tightly. He must on no account put up his hands to his eyes, but lie perfectly quiet. The room is of course darkened. For the first day it is advisable to give light diet. The wound should not be inspected for a week, and the nurse must on no account attempt to remove the plasters. The bandage may be removed, and the outside of the lids gently wiped with a little moistened cotton-wool once daily, or oftener if necessary; but some surgeons prefer to leave the eyes absolutely alone. The patient may be allowed to sit up in a few days. After the removal of the plasters a shade must be worn, and eventually a powerfully convex glass will be required to replace the lens.

Glaucoma. Glaucoma is a disease of the eyes which is uncommon before the age of fifty. It is characterised by a greatly increased pressure in the eyeball, which comes to feel as hard as a stone in advanced cases. An early iridectomy is often necessary to relieve the pressure, or the sight may be rapidly lost.

Short- and long-sightedness. Myopia. In the next place we must refer to short- and long-sightedness. Short sight, or myopia, consists in a condition of the eye where the rays of light, instead of being focussed on the retina as they are normally, fall short of this and are focussed in front. In fig. 38 let R represent the retina and L the lens. It will be seen that the rays of light come to a focus (F) in front of the retina.

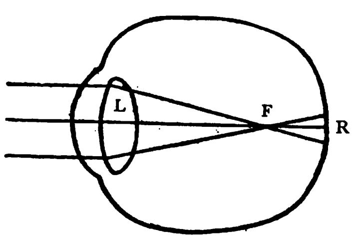


FIG. 38.—CONDITION OF THE EYE IN MYOPIA.

Hyper-metropia. The opposite condition, long-sightedness, or hypermetropia, consists in a focussing of the rays too far back, so that the point of focus lies behind the retina (fig. 39). To remedy these conditions we resort to glasses; in the case of myopia a concave glass of requisite strength is necessary,

and in hypermetropia a convex lens. The concave lens acts by causing the rays to be focussed farther back, and the convex by bringing the point of focus farther forward. Figs. 40 and 41 will show the action of the respective glasses: the dotted lines represent the direction taken by the rays when the concave and convex glasses respectively (Gl) are brought into use. The eyes are tested for distant vision by a series of letters and types arranged on a specified scale for reading; and we are accustomed to describe the acuteness of vision according to the ability to read the letters or type at a certain distance.

Testing the eyes.

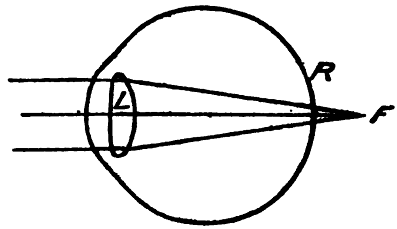


FIG. 39.
CONDITION OF THE EYE IN HYPERMETROPIA.

Squint.

The condition known as squint (strabismus) depends on faulty action of the muscles which move the eyeball, and

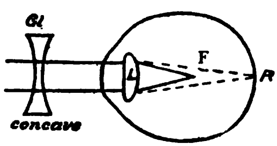


FIG. 40.
CORRECTION OF MYOPIA.

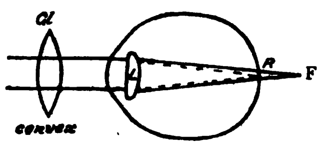


FIG. 41.
CORRECTION OF HYPERMETROPIA.

Cause.

such faults may arise from several causes. It may be cured by suitable glasses, or, when due to paralysis of the muscle or muscles producing it, by drugs or electricity. In many cases division of the tendon of one of the muscles is necessary, close to its attachment to the eyeball. Squint is often associated with long- or short-sightedness.

CHAPTER XVIII.

CASES OF EMERGENCY.

INCLUDED under this heading are cases of poisoning and certain surgical cases. We shall, in the first place, consider the commoner poisons, commencing with the management of poisoning cases generally.

Poisoning cases. **Accidental poisoning.**

Poisoning cases may be accidental, suicidal, or criminal. Accidental cases of poisoning arise, far too commonly, from the administration of medicines out of a wrong bottle. It cannot be too strongly insisted upon that all bottles containing liniments or other applications for external use should be suitably labelled, and as far as possible contained in special bottles. The bottles generally used for such applications are of a dark blue or green tint and ribbed. Poisons in a ward should always be kept under lock and key. Precautions such as these will reduce to a minimum cases of accidental poisoning.

Criminal poisoning.

The circumstances attending cases of accidental and suicidal poisoning may often lead the medical man to a correct diagnosis. It is in cases of criminal poisoning, especially those of long duration, where the symptoms are often slight and ill marked, that difficulty is especially likely to arise. In such cases the presence of a trained nurse is of the utmost value, and it is of the highest importance that she should be acquainted with the usual symptoms and signs of the commoner poisons. Where criminal poisoning is suspected the nurse will be required to exercise great tact and attention to details. She will have to observe every suspicious fact, and duly report to the doctor. The preparation of the food and the chances of the introduction of poison into it must be taken into account. The relation of vomiting to the taking of food

is important. Any suspicious actions on the part of relatives or others in attendance on the patient, such as the throwing away of vomited matter which has been ordered to be kept, must be noted. Where there are sufficient grounds to justify a reasonable suspicion, the vomited matter, and perhaps also the urine and fæces, will be submitted for chemical analysis to an expert.

Management of acute poisoning cases generally.

Enough has been said on this subject to show how important a part a nurse may be called upon to take in such a case. In the management of acute poisoning prompt action is obviously necessary to save life. The doctor may not be immediately available, and the nurse will be called upon in many cases to act on her own responsibility. She will in the first place make enquiries, either from the patient, where possible, or from his friends, as to the nature and quantity of the poison, and when it was taken. She will next enquire as to vomiting and any other symptoms and signs which may be present, ascertaining the length of time such symptoms and signs have taken to appear.

Emptying of the stomach.

We may lay it down as an axiom, to which there are few exceptions (see Corrosive Poisons, p. 170), that the stomach should at once be emptied. This may be accomplished by emetics, or by the stomach-pump or syphon-tube. Should a nurse have to act on her own responsibility, she may administer a large tablespoonful of mustard in a tumbler of warm water or thirty grains of sulphate of zinc. Vomiting may be assisted by tickling the throat either with the finger or by means of a feather. The vomited matter should be preserved for the doctor's inspection.

Treatment of collapse.

In addition to the evacuation of the stomach contents treatment must be directed to the collapse which is so often present. The patient should be placed in bed or on a couch as a general rule, with hot bottles to his feet. Before the arrival of the doctor, if the collapse be extreme, strong hot coffee may be administered, also strong beef-tea. Occasionally the nurse may require to give brandy on her own responsibility by the mouth or the rectum when life is endangered by the collapse, as evidenced by great weakness or absence of the pulse at the wrist and a very low temperature. In the meantime drugs, such as ether, strychnine, digitalis, and strong ammonia, should be in readiness for

the doctor, together with a hypodermic syringe, stomach-pump, or syphon-tube, and a gag.

Artificial respiration. Artificial respiration, to which we shall refer when speaking of the restoration of the apparently drowned, may be required when breathing is very feeble or has entirely stopped.

Stomach-pump and syphon-tube. The stomach-pump consists of a long pipe with a branch at right angles, and is so constructed that fluid can be pumped into and out of the stomach as desired, and so the organ can be thoroughly washed out. The syphon-tube is a long piece of rubber tubing with a glass funnel attached to one end. The tube is passed into the stomach, and the funnel raised above the patient's head. Fluid is now poured down the tube, and, when filled, the end of the tube is brought down to a lower level than the patient's stomach, when the stomach contents flow out by syphon action. This is repeated until the fluid returns clear. A good fluid to use for washing out is a weak solution of Condy's fluid (pale pink colour) in tepid water.

Having now referred to poisons in general, it will be necessary to allude briefly to some of the commoner poisons and their special management.

Corrosive poisons. Certain poisons, such as strong acids and alkalies, by their destructive action on the tissues, may cause death. These are known as corrosive poisons. **Oil of vitriol.** Oil of vitriol (sulphuric acid), which may be taken as an example of this class, is occasionally taken by children or drunkards. Such a poison produces immediate symptoms—a burning pain in the mouth, which becomes white all over, vomiting, and collapse. If death does not rapidly occur, it may supervene later from perforation of the stomach, as a result of the ulceration produced.

Management. In cases of poisoning by acids we give alkalies (mild), such as chalk, magnesia, or common washing-soda, which we may find in nearly every house. Flour-and-water is a good mixture. When an alkali has caused symptoms of poisoning, the readiest remedy at hand is usually vinegar. Olive oil may be given.

Oxalic acid. A powerful and not uncommon poison is oxalic acid, popularly known as acid of sugar. The destructive action is not so marked as in the case of the stronger acids,

such as sulphuric and nitric. A burning taste in the mouth and pain in the stomach, with acid brownish vomit and marked collapse, are present. It rapidly causes death. By far the best remedy here is chalk. Where chalk cannot be obtained at once we may use the plaster from the ceiling. **Symptoms.** **Remedy.**

Emetics are not only unnecessary in these cases of poisoning, but may be actually dangerous by increasing the damage already done to the coats of the stomach; for the same reason we refrain from using the stomach-tube or syphon.

We have seen that some poisons act by virtue of their corrosive action on the tissues. The greater number of poisons, however, act by interfering with the various physiological processes of the body, and are hence known as physiological poisons.

A large number of physiological poisons (irritants) act chiefly on the alimentary canal, causing nausea, vomiting, and diarrhœa, with pain in the abdomen, symptoms not unlike those met with in cholera. Examples are phosphorus, arsenic, mercury, and carbolic acid. Cases of phosphorus poisoning arising from sucking matches have been recorded. **Physiological poisons.**

The remedies most likely to be at hand which are of value in poisoning by arsenic are magnesia and carron oil. **Arsenic poisoning. Remedies.**

The form of mercury which is such a powerful poison is the perchloride, commonly known as corrosive sublimate. In this case we administer white of egg in large quantities, milk, and flour-and-water. **Corrosive sublimate. Remedies.**

Poisoning by lead is usually chronic, and will be referred to in a subsequent chapter (see chapter xxvi.).

Carbolic acid poisoning is by no means uncommon. The inside of the mouth is whitened. There is pain in the throat, and also in the stomach. The urine becomes of an olive-green colour. Here we empty the stomach by a soft tube, and then pour down the tube oil, melted butter, or glycerine, to protect the injured mucous membrane. It is recommended by some to give a large dose of Epsom or Glauber's salts, or both. Such remedies, by combining in the system with the acid, produce thereby a comparatively harmless compound. **Carbolic acid.**

We now turn to a group of poisons commonly called

Narcotic poisons. narcotic, whose principal effect is to cause insensibility. The only one to which we need refer at any length is opium.

Opium poisoning. Symptoms. A patient the subject of poisoning by opium or morphia generally presents certain well-marked symptoms. At first there is a great tendency to sleep, with deep breathing, flushed face, and moist skin. The patient can often now be roused, but soon relapses into his former condition. As the symptoms progress it becomes impossible to rouse him. The breathing becomes irregular, the pulse feeble, and the pupils pin-point. There is a cold clammy sweat. If death does not occur in twelve hours after the poison has been introduced into the body, there is a good prospect of recovery. We may have difficulty in deciding whether the symptoms are due to opium poisoning, apoplexy (hæmorrhage into the brain), alcoholism, or uræmia (see chapter xxv.).

Management. Regarding the treatment of opium poisoning, in addition to what has been said about the general treatment of poisoning, it is necessary to lay stress on the importance of rousing the patient, and preventing sleep by every means in our power. A good plan is to walk the patient about at short intervals; for this two persons are generally required, one on each side. Slapping the body with wet towels is also useful. In advanced cases artificial respiration may be necessary, also stimulation of the heart by the battery. Strong hot coffee is a valuable and easily obtained remedy which must always be given; it may be administered by the stomach-tube or per rectum.

Belladonna poisoning. Another narcotic poison is belladonna or deadly nightshade, and its active ingredient, atropine. The pupils are dilated in this case, and, unlike poisoning by opium, the patient shows evidence of noisy delirium, which attracts attention; hence recovery is more frequent than in opium poisoning. In addition to general measures the nurse may apply cold affusion to the head and face.

Acute alcoholic poisoning. The last poison of this class we shall mention is alcohol. Acute alcoholic poisoning oftens presents alarming symptoms, and death may occur rapidly. The symptoms are frequently very similar to those of advanced opium poisoning. The breath usually smells of alcohol; but this is not reliable, as alcohol may have been given to relieve symptoms which may be due to another cause.

The management consists in the emptying of the stomach and the application of cold affusion to the face, with stimulation of the body by warmth and hot drinks. A mustard plaster may also be applied to the nape of the neck. **Management.**

We shall conclude our account of the commoner poisons by referring to two common and powerful poisons—namely, prussic (hydrocyanic) acid and strychnine.

Prussic acid produces rapid insensibility. The patient lies on the ground, with staring eyes and dilated pupils. Breathing is slow and irregular, and the pulse is feeble or even absent. The rapidity of the onset of the symptoms, together with the peculiar penetrating odour of the breath, often enables us to detect poisoning by this substance. Where convulsions occur the symptoms may resemble those of epilepsy. **Prussic acid poisoning. Symptoms.**

In the management of a case of prussic acid poisoning the greatest promptitude is necessary. Cold water poured over the head and back is the best remedy, and one always at hand. It acts by rousing the respiratory functions. Artificial respiration must be kept up perseveringly. In fatal cases death generally occurs in half an hour or less. **Management. Cold affusion.**

Strychnine, the active ingredient of the nux-vomica seed, is sometimes given or taken as a poison. It is the poisonous constituent of rat-poison. The chief symptoms of strychnine poisoning consist of muscular spasms and convulsions. The body becomes stiffened and arched. Unlike tetanus (lock-jaw), the jaws are affected later. The fits go off altogether for a minute or two, to return on the slightest provocation. Death usually results from exhaustion. In this case we administer emetics. We avoid cold affusion. To relieve the spasms it is usually necessary to place the patient under chloroform. We try to prevent the slightest noise or excitement, which may bring on or increase the spasms. The strength must be supported by all the means in our power. Artificial respiration may be required. **Strychnine poisoning. Muscular spasms.**

The table on the following page gives the more important points in the management of the commoner forms of acute poisoning.

Name of Poison.	Management.
Poisons in General.	Evacuation of stomach contents by emetics or stomach-pump or -tube, unless contra-indicated. Treat collapse and other symptoms.
Corrosive Acids { Sulphuric. Nitric. Hydrochloric.	Do not give emetics. Give chalk, magnesia, or washing-soda, flour-and-water. Treat collapse.
Oxalic Acid.	Give chalk, whiting, or wall-plaster. No emetics. Treat collapse.
Corrosive Alkalies { Caustic Potash. Quick-lime. Ammonia.	Give weak acids or vinegar or lime, lemon or orange juice, oil, flour-and-water.
Phosphorus.	In early stages sulphate of copper (5-10 grs.), magnesia, oil of turpentine.
Arsenic (acute poisoning).	Emetics, if vomiting has not occurred: magnesia, carron oil, ferric hydrate.
Mercury (Perchloride of).	White of eggs (raw), milk, flour-and-water, followed by an emetic.
Lead (acute poisoning).	Epsom salts, dilute sulphuric acid, emetics (sulphate of zinc).
Carbolic Acid.	Soft stomach-tube to empty stomach, followed by oil, melted butter, or glycerine by the tube. Treat collapse and pain.
Opium and Morphia.	Emetics and stomach-pump. Prevent sleep, and rouse patient by walking about, cold affusion, slapping with wet towel, etc.; hot strong coffee; artificial respiration; atropine hypodermically; battery.
Belladonna and Atropine.	Emetics and cold affusion; morphia subcutaneously; stimulation.
Acohol (acute poisoning).	Emetics, stomach-pump, cold affusion; stimulation by warmth, hot coffee, and the battery.
Prussic Acid.	Cold affusion to the head and spine, stimulants, artificial respiration.
Strychnine.	Emetics in early stage, chloroform or ether vapour, alcohol, artificial respiration.

In the next place we shall refer to certain emergency cases which the nurse may meet with other than those of poisoning. We have already had to mention many such cases when speaking of wounds and their complications, such as hæmorrhage, also fractures and dislocations.

Cut-throat. Cases of cut-throat are usually suicidal. They are often dangerous. Fortunately, however, the would-be suicide is not usually acquainted with the position of the great blood-vessels of the neck, and it is the windpipe or laryngeal cartilages which often suffer when the wound is a deep one. Such a patient should on no account be left alone. A policeman is usually summoned to take charge of the case. The nurse endeavours to alleviate any urgent symptoms until the doctor's arrival. She may in cases of hæmorrhage apply pressure to the nearest large artery between the heart and the wound. The head should be propped up and kept well forward. Cut-throat wounds used always to be left open. Now many surgeons prefer to close them up at once. The structures involved by the wound will help the medical man in his decision.

Cases of obstructed breathing. In all cases of obstructed breathing the doctor must be hurriedly summoned, and the nurse must make all preparations for tracheotomy (see Tracheotomy, p. 194). In the meantime she will pass her finger into the mouth to see if any foreign body is obstructing the upper opening of the larynx. Such a condition may arise, not only from foreign bodies in the air-passages, but also from croup, diphtheria, or scald of the larynx.

Treatment of those apparently drowned. **Sylvester's method of artificial respiration.** The treatment of those apparently drowned consists in the thorough cleaning out of the mouth of mud and other foreign matter, and at once proceeding to perform artificial respiration. The best way of performing this is that known as Sylvester's method. Lay the patient on his back with the head at a low level; grasp the arms above the elbows, and draw them firmly above the patient's head; keep them in this position for two or three seconds; and then bring them forcibly downwards across the chest, against which they should be firmly pressed. This constitutes the series of movements, which should be repeated in about five seconds' time, and carried out deliberately and coolly. They are illustrated in the diagrams (fig. 42). These movements must be persevered with for from half an hour to an hour,

or even longer; they should never be relaxed until it is quite obvious that life is extinct. The tongue should be pulled forwards with forceps. As soon as possible the wet clothes should be removed and replaced by hot blankets. Hot bottles or hot bricks should also be applied to the

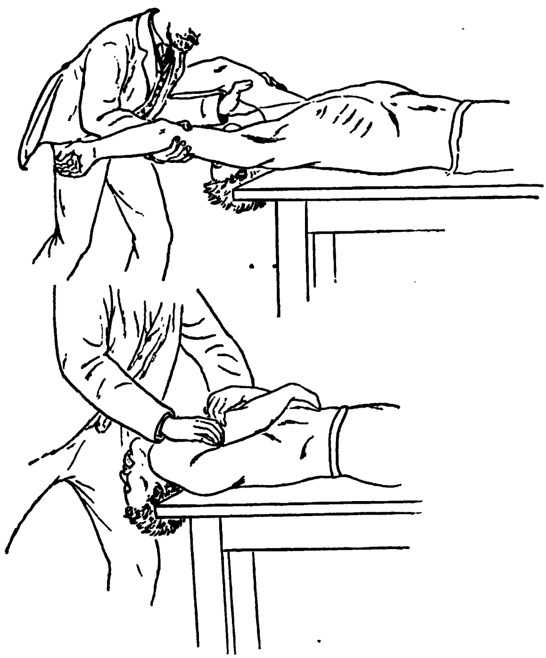


FIG. 42.—DIAGRAMS TO ILLUSTRATE THE PERFORMANCE OF SYLVESTER'S METHOD OF ARTIFICIAL RESPIRATION (CAIRD AND CATHCART).

feet. Respiration may also be promoted by other means, such as electricity, friction of the limbs, ammonia applied to the nostrils, and by hypodermic or rectal injections of brandy and other remedies. Warm drinks should be given at a later stage, when consciousness has fully returned.

We have seen that unconsciousness may arise from severe head injuries, from some poisons, and also as a

Other causes of unconsciousness. result of apparent drowning. It may also occur in cases of hæmorrhage into the brain (apoplexy), in the disease known as uræmia, which is closely associated with chronic kidney disease (see p. 330), and in epilepsy. In the case of the last named a diagnosis is generally easy, but in other cases it may not be possible at once to ascertain the cause of the unconsciousness. An account of the history of the case often throws some light on the cause.

Epileptic fit: its management. A person seized with an epileptic fit should be placed in a safe position on the ground or floor, with the clothes loosened and a pillow or cushion placed under the head; he should be left so until the fit is over. Something should be placed between the teeth, to prevent the tongue being bitten.

Fainting In fainting there is a temporary loss of consciousness. The patient should either be placed flat upon the ground with the head low, or else the head may be bent down between the knees in the sitting posture. Both of these methods act in the same way by promoting the flow of blood to the brain. Stimulants are not as a rule necessary. Ammonia (smelling-salts) applied to the nostrils assists the return to consciousness.

In other cases of unconsciousness the patient should as a rule be rapidly placed in bed and hot bottles applied to the feet. The nurse should endeavour to have at hand everything the doctor may require, such as stimulants, emetics, stomach-pump or -tube, hypodermic syringe battery, etc.

In speaking of the various medical diseases in later chapters we shall often have to refer to emergencies connected therewith.

Severe abdominal wounds. In severe abdominal wounds, in which, perhaps, the contents of the abdomen may be actually protruding, the wound should be covered with a clean flat sponge wrung out of hot carbolic lotion (1-40).

The subject of strangulated hernia is discussed in the chapter dealing with operations (chapter xix.).

Retention of urine. Retention of urine is much more common in the male. Until the doctor's arrival the nurse should apply fomentations over the bladder; and when the pain is very severe a few drops of laudanum may be sprinkled on the hot flannels. She should in the meantime have the catheters,

both metal and soft, in readiness. A warm bath often enables the doctor to pass an instrument where he had previously failed to do so. It is often necessary also to give opium or morphia to relieve the spasm which is sometimes present. Occasionally the bladder has to be tapped above the pubes.

The cleanliness of catheters. A word here about the importance of keeping catheters scrupulously clean, and especially when dealing with cases of retention of urine. After use the catheter or catheters should be placed and kept in weak carbolic lotion, and thoroughly rinsed both before and after use. A dirty catheter introduced into the bladder will in many such cases set up inflammation of the organ (cystitis), which may even cause death by the spreading upwards of the inflammation to the kidneys. Hence the necessity of using every effort to prevent the entrance into the bladder of any septic material.

Retention of urine often arises as a result of stricture of the urethra, or from enlargement of the gland known as the prostate, which surrounds the neck of the bladder in the male. This enlargement occurs very commonly in elderly men, and often gives rise to partial or entire inability to empty the bladder. Retention of urine occurs, too, not uncommonly in the condition known as the typhoid state (see chapter xxi.), in which the patient is in a state of stupor or even coma. The nurse must always be on the look out for this under such circumstances. We shall have to allude to this again when speaking of the specific fevers.

CHAPTER XIX.

THE DUTIES OF THE NURSE IN RELATION TO OPERATIONS, BOTH GENERAL AND SPECIAL.

It is most important that the nurse should be able to render intelligent aid during surgical operations; and not only this, but that she should also be able to undertake the preparation both of the patient and also of the operating theatre or room. We shall therefore consider all these points in turn, and, after discussing operations in general, shall proceed to describe some of the commoner and more important operations, as far as the nurse is able to appreciate such description.

Operations in hospital. We shall confine ourselves in the first place to operations in hospital, and shall afterwards refer to operations in private.

Operations, it is almost needless to say, vary very considerably in their degree of severity, and according to the object for which they are undertaken. They may be divided into those of convenience and those of necessity; or again, they may be undertaken to remove disease, or, when this is impossible, simply to give relief. Many operations are now performed under local anæsthetics, of which cocaine, chloride of ethyl, and anestile are among those most frequently used (especially the first named); in some cases no anæsthetic may be required. But in the vast majority of cases a general anæsthetic is necessary, such as ether or chloroform.

Anæsthetics. A word about anæsthetics. Ether and chloroform have both their advantages and their disadvantages, and it is useful for the nurse to be acquainted with these.

Chloroform. Chloroform is the more dangerous anæsthetic; it is pleasanter to inhale, and it is generally well taken by

children, to whom ether is seldom given. It requires no special apparatus, as does ether, but may be given on a towel or a piece of lint.

Ether. Ether produces a disagreeable sense of suffocation. It is apt to irritate the bronchial tubes, and should not therefore be given to elderly people with a tendency to bronchitic trouble. Lastly, ether is inflammable, and should be carefully handled at night.

Each anæsthetic has its own advocates.

Clover's inhaler. The apparatus in general use for the administration of ether is that known as Clover's inhaler, which consists of three parts: (1) a reservoir to contain the ether; (2) an india-rubber bag, into which the patient breathes; and (3) a face-piece, which is placed over the mouth and nose.

Nitrous oxide (laughing gas). Nitrous oxide (laughing gas) is a very favourite anæsthetic with dentists. It is pleasant to take, but can only be breathed for a very limited period of time, and is consequently only adapted for very rapid operations. The gas is kept under a very high pressure in iron cylinders. A favourite method nowadays is to administer gas and ether by a modified Clover's inhaler. **Gas and ether.** The patient commences by breathing the laughing-gas, and when he has "gone under" ether is substituted. By this method the disagreeable sensation caused by inhaling ether is overcome, and time is saved.

Administration of chloroform by nose and ether by rectum. Under certain circumstances chloroform or ether may be administered through the nose or per rectum respectively: for example, in operations in or around the mouth. The writer has seen ether administered by the rectum in such cases with much benefit. In this case the bottle containing **Method of giving ether per rectum.** the ether is placed in a basin of water kept at a temperature of about 120° F., and the ether is conducted by a long rubber tube into the rectum. The method has not been at all universally adopted yet, and more observation is required before it can come into general use.

The preparation of the patient for operation. We next pass to the preparation of the patient for operation. It is a good rule to administer an aperient on the evening before operation, with, in some cases, an enema in **Aperient.** the morning. No food should be given for at least three **Time to give food before an anæsthetic.** hours before operation, and the last meal should be of a light and easily digestible character, such as a cup of hot bread-and-milk, or a small quantity of strong beef-tea. In

cases of debility or collapse a little brandy-and-water may be given by the doctor's orders shortly before operation, either by the mouth or per rectum. When possible a patient should be placed in bed or at rest for a day or two before operation, and the general health must be brought to as high a level as possible. During this period the urine will be examined and the bowels regulated.

Rest in bed prior to an operation.

We have so far been speaking of cases which do not call for immediate operation. In cases of urgency we have to operate at once or with very little delay, and in these cases the preparation of our patient cannot be so complete as we should wish. Under such circumstances the nurse must prepare the patient as far as is possible; and as these cases are more liable to suffer from collapse, every effort must be made to counteract this by warmth, and, if necessary, by stimulants.

Operations of emergency.

The preparation of the patient includes the cleansing of the skin, where this is possible, over the site of operation. The skin must be thoroughly washed with soap and water, and in some cases other applications, such as turpentine or ether, may be called for, to remove fatty material and other secretions. After the skin has been well cleansed a carbolic or perchloride of mercury compress should be applied.

Cleansing of the skin.

The house surgeon generally undertakes shaving of the part, where this is necessary; but the nurse should include this in her duties. Especially in abdominal surgery is it of the greatest importance to render the skin "surgically clean"; but the nurse must associate in her mind the utmost cleanliness, both as regards her own person, her patient, the theatre, and all instruments, with any surgical operation, however trivial.

Shaving.

Importance of the utmost cleanliness in everything.

Before leaving the subject of the preparation of the patient reference must be made to the mental state of the patient, what we may describe as the "psyche." A nurse can do much to reassure her patient. It is only natural that operations should be looked on with dread by most people, and it is the duty of both nurse and doctor to try to minimise this feeling as much as possible. It will rest with the doctor to explain to the patient the nature of the operation required, and its gravity; but the nurse can do much towards placing the patient at ease; and it should not be forgotten that the success of an operation may some-

Mental state of patient.

times depend to a considerable extent on the mental state of the patient.

Best time for operating. The best time for operating is the early morning; and this for several reasons. Both the doctor and his patient are fresher, the light is good, and the patient has more chance of settling down for the night. Again, the doctor can pay, when necessary, a visit in the evening, and there are greater facilities for combating any complications or accidents that may come on shortly after the operation. This arrangement, too, is more convenient for the nurse. It is almost unnecessary, however, to say that it is often not possible to arrange matters thus.

Advantage of ward and theatre on same floor. It is an advantage for the patient to be placed in a ward or room on the same floor as the theatre, thereby reducing to a minimum the tendency to jolting caused by carrying up- and down-stairs.

Whenever possible the patient should be placed under the anæsthetic before he is brought into the theatre: this obviates the tendency to nervousness which we are so anxious to avoid.

Preparation of the theatre. Ventilation. Hot and cold water. The theatre must be clean and warm without being hot. The windows may be opened at the top, except in the coldest weather, until the commencement of the operation. There should be a plentiful supply of hot and cold water and ice, when it is at all likely to be required.

We shall refer to the anæsthetist's requirements, the instruments, and other necessaries in turn.

Anæsthetist's requirements. The nurse will prepare for the anæsthetist Clover's inhaler or a chloroform drop-bottle, both filled with their respective anæsthetic: this should be done only immediately before use. A clean towel, a porringer, and a pair of tongue-forceps will also be required: the latter consist of two fenestrated blades for drawing forward the tongue in cases where difficulty in breathing arises. For giving chloroform the anæsthetist will require either a Skinner's mask, a towel folded in the shape of a cone, or a fold of lint pinned in the form of a fan with a safety-pin, according to custom. When gas is to be given with ether, the cylinders containing the gas should be placed on the floor close to the anæsthetist, with the key for turning on the gas.

Articles for emergency use. There are certain articles which should be kept in a cupboard in the theatre for emergency use. Included

among these are brandy, sal-volatile, strychnine, solution of morphia (1-20), digitalis, atropine, and nitrite of amyl capsules. One or more of these may be required by the anæsthetist. A hypodermic syringe in good working order should be in readiness; also a battery and a cylinder of oxygen gas. Ether and chloroform should not be exposed to the light more than is absolutely necessary.

Instruments and their preparation. All instruments should be thoroughly washed and cleansed after each operation, so that they may be ready for immediate use. Instruments are now for the most part made entirely of steel, as being cleaner and adapted for boiling, a process to which they are commonly subjected to render them aseptic. **Sterilising apparatus.** For this purpose they are boiled in a sterilising apparatus, which consists of a tin case containing trays of wire network, in which the instruments are placed. A measured quantity of water and also of soda are placed in the receiver, and the gas-burners underneath are then lighted, and the water allowed to boil. Now the trays containing the instruments are introduced and left in for from two to five minutes. Sharp instruments should be placed in trays by themselves, and be removed in two minutes, otherwise their edge is blunted. The trays, on removal, are placed in carbolic lotion ready for use. If instruments are not boiled, all those which are likely to be required should be placed in a porcelain dish, and covered with carbolic lotion (1-20), and a towel wrung out of the lotion spread over the dish.

Caution. It should be remembered that perchloride of mercury spoils instruments, and this renders it unfit as an antiseptic for this purpose.

Instruments generally required. There are certain instruments which are almost always required for an operation, and which the nurse should have in readiness. These we shall now enumerate, leaving other instruments to be alluded to under the various operations: scalpels (various sizes); bistouries (sharp- and probe-pointed); scissors (curved and straight); probes and directors; dressing- and dissecting-forceps; artery-forceps (several pairs); syringes; retractors (large and small).

Other necessaries. The other necessaries which the nurse must prepare include needles, sutures, drainage-tubing, lotions, sponges, mackintoshes, and the various dressings and splints which will be required.

Needles. Needles should be placed in carbolic, together with sutures. It is as well to have a different vessel for these. Needles on handles and needle-holders may be required.

Sutures. Sutures include silk and catgut of various strengths, silkworm-gut, wire, and horse-hair.

Drainage-tubing. Drainage-tubing should be perforated before being handed to the surgeon, and thoroughly soaked in carbolic.

Lotions. The lotions required for the theatre are carbolic (1-20 and 1-40) and perchloride of mercury (1-1000). These are the antiseptic lotions in most common use.

Sponges: their cleansing. Sponges must be thoroughly clean. For ordinary operations medium-sized sponges are required, but in operations inside the mouth and under some other conditions small pieces are used, fixed on sponge-holders. For abdominal surgery it is advisable to keep a special set of sponges, which should include a large flat sponge for covering over the bowels.

Artificial sponges. Many surgeons dislike sponges, and look on them as a fertile source of sepsis, preferring to use pledgets of wool, which can be burnt after use. Sponges should always be counted before and after operations, especially in abdominal cases; they should never be torn up during an operation. A sponge which has been dropped on the floor must on no account be used again during the operation. After being thoroughly washed, sponges should immediately before use be wrung out dry of carbolic or perchloride lotion. A couple of hand-basins will be required for washing and cleansing the sponges.

Dressings. Under dressings must be included an antiseptic dusting-powder, such as iodoform or boracic acid, cyanide or sal-alembroth gauze, protective, jaconette, absorbent cotton-wool, lint, adhesive plaster or strapping, and calico, flannel, and gauze bandages. The nurse will prepare the dressings beforehand, according to the requirements of the case. While the patient is being operated upon, the nurse left in charge of the ward will make arrangements for his return to the ward. Hot bottles will usually be placed in the bed, and everything made comfortable. It is customary sometimes to have a bed made up in the theatre, to obviate any undue movement of the patient.

The after-nursing of the patient. In the more severe operations a special nurse will take charge of the patient, and not leave him at all for some

time after the operation; but in any case the nurse must remain with him until he has entirely regained consciousness. All unnecessary speaking must be forbidden by the nurse, and she must have definite orders with regard to moving him, the administration of nourishment, medicine, and stimulants; also, in certain cases, the passing of the catheter in the female. She must be careful to note any untoward symptom, and yet she must endeavour not to worry or disturb her patient in any way. After serious operations it is advisable to keep a regular report with regard to the taking of nourishment, sleep obtained, etc.; it is almost unnecessary to insist on the regular recording of the pulse, temperature, and respirations after operation. The nurse must on no account allow any friends to see the patient either before or after operation without the doctor's permission. In dangerous cases the relatives should be sent for without delay, and informed of the patient's condition. This duty will usually fall to the doctor. The nurse must on no account take or throw away anything removed by operation, such as a tumour or a stone, without the doctor's leave. She must be careful to leave no trace of any previous operation which might frighten or otherwise upset the patient on his coming into the theatre.

Operations in private.

We must now say a few words about operations in private, and point out the more important points in the preparations required. The nurse may have been specially engaged for the case, or she may be required simply for the operation, the after-nursing being left to the relatives. Or again, in the case of a district nurse, she may be required to assist at the operation, and to visit daily, once, twice, or oftener, as the case may demand. Operations in practice are attended with more difficulties than are those in hospital, and this for several reasons. Appliances are not as a rule so easily obtainable, the facilities for nursing are less, and the wholesome discipline and *régime* of hospital life are absent.

The preparation of the patient should be conducted on the lines already laid down.

Inspection and selection of the room.

The nurse must, on the previous day, or even earlier, inspect and prepare the selected room, which should face the south if possible. The room should also be lofty, bright, and of course thoroughly clean. It will be most

convenient for the operation to be performed in the room which the patient is to subsequently occupy. The ordinary hospital bed with a spring mattress is the most suitable one to select.

Operating-table. The operating-table should be firm and strong: a good kitchen-table will be found most satisfactory. It should be placed near the window in a good light, and be comfortably arranged with blankets and pillows. Near it stands a small table, on which are placed the instruments in a tray containing carbolic lotion (1-20), and covered with a towel wrung out of the lotion. It will facilitate matters if a complete list of all the instruments and requisites for the operation be prepared by the doctor beforehand, so that nothing may be forgotten.

The after-treatment will not differ materially from that already mentioned; but the nurse must remember that her responsibility is greater than it would be in hospital, where help is more readily obtainable in cases of emergency.

It will be seen, then, that nearly everything that has been said regarding the conduction of operations in hospital will apply to those in private.

Private hospitals. Private hospitals are now numerous, and many of the large hospitals contain wards for paying patients. It is thus often possible for a patient to obtain the advantages of a hospital together with the privacy of his own house. It is especially in the major operations, where skilled nursing and constant attention are necessary, that such institutions are so valuable.

Some of the commoner operations must now be briefly passed in review, and the special points to be known by the nurse considered.

Amputations. We shall commence with amputations. Amputation is undertaken for many different reasons, and the operation may be a very trivial one, as in the case of removal of part of a finger or toe; or of the greatest severity, as in amputation at the hip-joint.

Syme's amputation. We shall take as our example one of the commonest of amputations, that called after the famous surgeon Syme, where the foot is removed at the ankle-joint (fig. 43). For this operation the following are required, in addition to the general instruments already enumerated:—A strong narrow knife, with a blade about three inches long; a saw and a

pair of bone-forceps, together with an Esmarch's tourniquet. The blood is first driven as far as possible out of the foot and lower part of the leg by raising the limb and applying an elastic bandage from the foot half-way up the leg. The tourniquet is now applied to the leg over a piece of lint or flannel, and the bandage removed. The foot projects over the end of the table. The incisions pass across the front of the ankle-joint and under the sole of the foot. The lower ends of the tibia and fibula are sawn off, and the flaps are brought together. A drainage-tube is usually required.

In an amputation, then, the first step is to make the necessary incisions: the bone is then exposed and sawn; and after this the hæmorrhage is arrested, first temporarily, then permanently, and the flaps brought together. The stump is then dressed and bandaged and placed on a splint. After amputations it is common for the patient to complain of the limb "jumping." This can best be overcome or lessened by fixing the limb firmly on a raised pillow. To prevent the limb "rolling" sand-bags are generally used. The subsequent treatment is that of an ordinary wound.

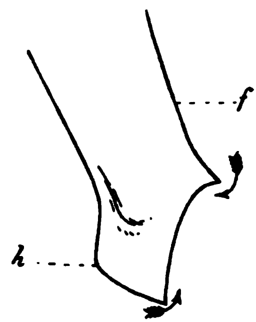


FIG. 43.—LEG AFTER SYME'S AMPUTATION.
f. Front of leg.
h. Heel.

Many limbs which were formerly amputated for extensive joint disease are now saved by excising the joint. By this we mean removing the ends of the bones which form the joint. Our example will be excision of the hip-joint. **Excision of joints.**

For an excision the special instruments required are bone-, necrosis-, and lion-forceps, periosteum-detacher, saws (in this case a narrow saw fixed in a large handle, and known as Adam's saw), chisels, osteotomes, mallet, bone-gouge, and a sharp spoon. **Excision of the hip-joint.**

The joint is opened by an incision either in front or behind the joint or on its outer side. After washing out the joint the saw is introduced, and the neck of the femur is sawn across or divided with an osteotome, which is an

instrument shaped like a chisel, but having both edges bevelled. The head of the femur is next removed with necrosis-forceps, and it will generally in these cases be found to be diseased. The acetabulum is now explored, and, if necessary, scraped, and the cavity is then dried. Iodoform and glycerine emulsion is now poured into the wound, and the dressings are applied. A drainage-tube may or may not be required. The best apparatus to apply is a double Thomas's hip-splint, to which we shall have to refer later. From the nature of the case convalescence is generally protracted.

Osteotomy. We next turn to osteotomy, by which we mean the division of a bone in its long axis to rectify deformity. The bone may be simply divided or a wedge-shaped portion may be removed, and either of these methods may be practised with a saw, a chisel, or an osteotome. A mallet, sand-bags to support the limb, and some form of splint will be required, in addition to the instruments already mentioned.

Genu valgum. As an example of this operation we shall speak of the condition known as genu valgum, or knock-knee, which is often the result of rickets. Genu valgum consists in an overgrowth of the lower end of the femur on its inner surface (internal condyle). **McEwen's operation.** To remedy this disease McEwen has devised an operation, which bears his name. Briefly, it consists in making an incision over the lower end of the femur on its inner side. The tissues are divided down to the bone. The osteotome is now introduced into the wound, and the scalpel withdrawn. Turning the osteotome at right angles to the direction of the wound, it is made to penetrate the bone in the required direction until division of the bone is nearly completed. The osteotome is then withdrawn, and a pad placed over the wound, and the fracture of the bone completed with a jerk of the hand, the femur being kept still and the leg made use of as the lever. Careful antiseptic precautions are most important. A Croft's splint or poroplastic or plaster of Paris may be used to fix the limb.

We shall conclude our remarks on operations on the bones and joints by mentioning the disease known as necrosis, which means death of a portion of bone or of a whole bone.

- It is often necessary to undertake operations for the removal of necrosed bone in various parts of the body. The dead bone is usually found at the bottom of a sinus, and may be superficial or covered by new bone, when the operation becomes more difficult. After removing the necrosed bone (sequestrum) with necrosis or other forceps, the cavity is packed with iodoform and gauze or other material, and allowed to granulate up. This is often a very long process. An Esmarch's tourniquet may be required, as well as the various bone-forceps, and sometimes a mallet and chisel. **Operations for necrosis.**

In the next place we must speak of the ligature of arteries in their continuity. This operation is usually undertaken for the cure of an aneurism. The best example we can take is ligature of the femoral artery in the case of aneurism involving the popliteal artery. This artery is usually tied in the upper part of the thigh. A couple of pairs of dissecting-forceps, blunt hooks, and an aneurism-needle are the special instruments required. Either catgut or silk may be used. The material should, however, be strong and smooth, and must be thoroughly boiled before use. The patient lies on his back, with the thigh partly flexed and lying on its outer side, the knee being bent. The line of the artery is mapped out, and an incision of requisite length made over the line of the vessel. **Ligature of arteries in their continuity.** **Incision.**

The next step is the exposing of the artery, which is apt sometimes to cause trouble. The pulsation of the vessel renders valuable assistance. The sheath or bed in which the artery lies is now opened, and the unthreaded aneurism-needle passed under the vessel. On emerging, the needle is threaded and drawn back again. The knot is tied firmly, and with as little disturbance of the artery as possible. It is almost unnecessary to say that the knot is a "reef," and not a "granny." The limb is wrapped up in cotton-wool, and kept as warm as possible. The condition of the foot and toes must be observed from time to time, to see if the blood is circulating freely in the limb. Coldness and blueness of the toes will point to an obstruction in the flow of blood, and this, if not overcome, will result sooner or later in mortification of the affected parts. An artery may be ligatured in its continuity before proceeding to a severe operation, in order to check the hæmorrhage. An example **Exposure of the artery.** **Opening of sheath of artery.** **Passing of ligature and tying of knot.** **Signs of obstructed circulation in the limb.**

of this is seen in cases of removal of the tongue in whole or in part, when the lingual artery is sometines tied prior to the operation.

Removal of enlarged glands. The removal of enlarged glands will be necessary when an abscess threatens to form. This is not uncommonly seen in tubercular children, the glands in the neck being those most commonly affected. An incision is made over the gland or glands, which are shelled out entire if possible. When they are broken down, a Volkmann's spoon is generally required to scrape them out. The cavity is filled with iodoform and glycerine emulsion. The special instruments required are a sharp spoon and a dissector. Sometimes these two instruments are combined in one, a sharp spoon at one end and a dissector at the other end of the instrument.

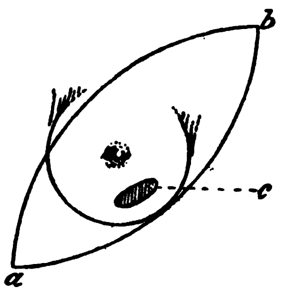


FIG. 44.—DIAGRAM TO ILLUSTRATE SHAPE OF INCISION (*a*, *b*) TO REMOVE THE BREAST.

c. Cancerous growth.

Removal of the breast for cancer. Operations for the removal of tumours vary very much, according to the nature and size of the tumour and the tissue or organ affected. We shall speak of one of the commonest operations of this class—namely, removal of the breast for cancer. It will suffice to say that cancer is a disease which affects almost entirely those in middle and late life, rarely occurring before thirty years of age. It is characterised by its rapid growth and its tendency to reappear after removal of the disease, more especially in those cases in which the glands have become affected, as invariably occurs sooner or later. Cancer has a special tendency to affect organs which are the seat of active processes, such as the stomach, bowels, breast, and uterus.

In cases of cancer of the breast it is customary to remove the whole organ, and also any glands which may be felt in the axilla. Most surgeons nowadays go even further than this, and clear out the contents of the axilla in every case, even when no glands can be felt, so as to lessen the chance

of a return of the growth. The arm is drawn away from the side, and the skin, which has of course been thoroughly cleansed, is put on the stretch. An elliptical incision is made sufficiently long to expose the whole organ, which is carefully dissected up from the chest-wall, bleeding being controlled with artery-forceps as the operation proceeds. After removing any enlarged glands which may be felt in the axilla (or when the axilla is opened up as a matter of course, after clearing out its contents), sometimes a very difficult procedure, as they are often attached to the blood-vessels, the skin-flaps are brought together, or as close together as possible, and a drainage-tube is inserted. A good supply of gauze and wool is necessary. The arm is fixed to the side and supported by a sling. The instruments required are merely those which have been enumerated under the general preparations for operations. A stout scalpel will be necessary to make the incision. Opium or morphia by the mouth or hypodermically will probably be required after the operation to relieve pain and procure rest.

We shall have to refer to tumours again when speaking of abdominal operations.

Trephining the skull.

We now turn to the operation of trephining, or, as it is sometimes called, "trepanning" the skull. This may be required in some cases of depressed fracture of the vault of the skull, where one or more fragments may be pressing on the brain and its coverings; also in some diseases, such as abscess and tumour of the brain. For the operation one or more trephines are required, with a little brush and quill, which are used and generally kept with the trephines; also a saw (known as Hey's saw) and bone-forceps; in some cases an "elevator" to lift up a depressed fragment of bone, and chisel and gouge. The other instruments required will probably be included in the "general list." The head must be shaved and covered with a carbolic compress.

Where there is a wound of the scalp, it is made use of in exposing the bone, being enlarged to the requisite extent by the scalpel. Otherwise a curved incision is made over the area to be trephined, and the flap raised and the bone exposed. In the case of a depressed fracture the fragments may sometimes be raised by the elevator or by the saw without having to resort to the use of a trephine. A nurse will learn more from seeing a trephine (which consists of a

circular saw fixed in a handle) than she can from any description of the instrument, and this indeed applies to all instruments. The trephine contains a little pin in its centre, which is fixed by a screw. This pin is protruded very slightly, and is fixed in position. The instrument is applied to the bone, and the point pressed down to keep the trephine from slipping. By rotatory movements the trephine now bores its way into the skull. The brush is used to keep the groove in the bone free from bone-dust, and the quill to ascertain to what depth the trephine has worked. On removing the little disc of bone, it is placed in a small receptacle containing warm antiseptic lotion (perchloride of mercury 1 in 2000 or 3000), to be replaced, if required, when the examination of the brain and its membranes is concluded.

In the case of abscess or cerebral tumour more than one trephine may be necessary, and the dura-mater will be opened, and the brain incised or punctured, as the case may require. When drainage is required, a metal tube is often used instead of the ordinary rubber tubing.

The patient must be kept absolutely quiet after the operation, and the room should be darkened. An ice-bag will generally be applied to the head.

Hare-lip. Turning now to the face, the condition known as hare-lip must be mentioned. This deformity consists of a cleft in the upper lip, which may extend as far as the nostril, or may simply be a notch in the lip. It may be single, when it is usually on the left side, or double. It is not uncommonly associated with cleft palate and other deformities, such as club-foot. The best time to operate is probably between the third and fourth months of infancy, but the operation may have to be deferred on account of ill health. It is most important that healing by first intention be obtained to prevent scarring, and for this good health is a necessity.

The operation. Briefly, the operation consists in thoroughly separating the lip from the jaw, in paring the edges of the cleft, and bringing them together with hare-lip pins and sutures. The hare-lip pins are stout pins with a round knob. Two are generally used, and silk is twisted round them in the form of a figure of eight. By this means the edges of the cleft are brought into exact apposition. The points of the pins are

nipped off. A covering of collodion is now applied, and a piece of strapping in the shape of a dumb-bell is fixed from cheek to cheek. The pins are removed at the end of the first or at any rate the second day. For this operation a sharp narrow scalpel is required, or a small tenotomy-knife; also a form of clamp to compress the lip and control hæmorrhage, a fine pair of scissors and dissecting-forceps and needle-holder, in addition to the ordinary instruments. A gag may sometimes be necessary. Oiled silk, collodion, plaster, and hare-lip pins are the other requisites.

Cleft palate. Cleft palate may be partial or complete, involving the hard or soft palate, or both. Operation will here have to be deferred as a rule until the age of three or four years. In infancy there will sometimes be a difficulty in giving nourishment. The child must be fed with a spoon or feeding-bottle with a large teat. A special gag invented by Smith is used. It also acts as a tongue-depressor. For the soft palate horse-hair or fine gut is used, and for the hard palate silver wire. The edges of the cleft are pared as before and brought together. Incisions through the palate on each side parallel to the cleft will usually be necessary, to enable the edges to be brought together, and to relieve tension. Small sponges wrung out of ice-cold water must be used to arrest the hæmorrhage. In addition to Smith's gag the following special instruments will be required: sharp- and blunt-pointed tenotomy-knives, Smith's cleft-palate needles, wire-catcher and wire-twister, sharp-pointed curved scissors, raspatories, and fine forceps. For the first twenty-four hours only milk and morsels of ice must be given by the mouth; then soft food until healing has taken place.

Removal of the tongue. Removal of the tongue. This operation is generally undertaken for cancer. The tongue may be removed in whole or in part. Our account will refer to removal of the whole organ with scissors. Sometimes the lingual arteries are first tied in the neck, to control the hæmorrhage; again, a preliminary tracheotomy may be performed, or the cheek may be slit up or the jaw divided. In these cases of course additional instruments and appliances will be required.

The operation. After passing a ligature through the tip of the tongue to draw it forwards, the organ is gradually freed from its attachments with the scissors and removed, the bleeding being controlled by pressure and by twisting and tying the

vessels. The cavity of the mouth is dusted with iodoform and packed with iodoform gauze after removal of the tongue. A ligature is passed through the stump of the tongue to control any subsequent hæmorrhage, and fixed to the cheek. The scissors used for the operation must be strong and probe-pointed. There are also required a gag, tongue-forceps, needle in handle, and several small sponges in holders, together with ice, as well as the usual instruments. Feeding per rectum for a day or two will be necessary, or else by a tube passed through the nose. If the jaw be divided, saws, bone-forceps, a drill, and stout wire will be also required.

Adenoid vegetations. Adenoid vegetations consist in an increase of what is known as "adenoid tissue," which is normally present in the upper part of the pharynx. These vegetations give rise to obstructed breathing, especially evidenced by snoring at night, also to deafness and a nasal tone of voice. The child commonly keeps the mouth open.

Operation. To remedy this condition the "adenoids" must be removed, and this may either be done by the finger-nail or by one of the various instruments devised for the purpose, such as Gottstein's curette. The child's head is allowed to hang well over the edge of the table, to prevent the blood, as far as possible, from passing down the throat. The requisites for the operation, in addition to the special instrument which the surgeon is in the habit of employing, include a gag and little pieces of sponge fixed in holders. The finger (or curette or forceps) is passed up behind the soft palate, and the vegetations scraped away. The bleeding is often considerable, but seldom gives rise to anxiety.

Enlarged tonsils: tonsillectomy. Very often enlarged tonsils and adenoid vegetations occur together: in such a case the tonsils will be removed by one of the various types of guillotine, or sometimes by a probe-pointed bistoury and a volsellum. Fluid food, lukewarm, must be given in these cases for the first day or two.

We must next refer to two operations on the neck, and the first one we take up is tracheotomy.

Tracheotomy. Tracheotomy, which consists in making an opening into the trachea, may be required for various conditions, characterised by difficult breathing, arising from laryngeal obstruction. It is also sometimes performed as a preliminary step in some serious operations in and about the mouth.

As tracheotomy may have to be performed with the least possible delay in cases of impending suffocation, it is most important that the nurse should be able to make the necessary preparations as rapidly as possible, and also to render prompt assistance. Not only this, but she must thoroughly understand the after-management of such cases, on which so much depends.

As an example of a case requiring tracheotomy we shall take a child with croup or diphtheria, in which urgent symptoms have supervened. When speaking of the trachea, we saw that the operation of tracheotomy was known as "high" or "low," according as the trachea is opened above or below the isthmus of the thyroid gland. It is the high operation which is now almost universally adopted. **The high and the low operation.**

The instruments required are scalpels, dissecting- and artery-forceps, director, sharp and blunt hooks, scissors, tracheotomy-tubes, tube-introducer, and trachea-dilator. There should also be at hand sponges, ligatures, tape, and feathers. **Instruments.**

The child should be rolled in a sheet or towel, with the arms fixed to the side. The head, which must be kept perfectly straight, is brought well over the end of the table, and a firm pillow or sand-bag is placed under the neck, which is thus put on the stretch.

The incision is made over the upper part of the trachea, and its rings exposed. The trachea is now drawn up with a sharp hook, which is applied to the cricoid cartilage, and opened with the scalpel cutting from below upwards. Before this is done all bleeding is arrested, unless the case be a very urgent one. As soon as the trachea is opened a fit of coughing usually comes on, and both doctors and nurses must stand on one side to prevent any infection by direct contact from the trachea contents. This accident has occurred only too commonly in the past. The outer tube is now introduced, sometimes with an introducer; the handle of the scalpel often does duty as a tracheal dilator and as a director for the tube as well. Before introducing the tube it is sometimes advisable to pass a feather down the trachea and up into the larynx, to clear away false membrane. After the outer tube is *in situ* the inner tube is introduced. The tube is fixed with tapes tied round the child's neck. **The operation.** **Caution.**

After-management. The nurse must give her whole attention to the management of the case. The patient must on no account be left. The bed or cot is converted generally into a tent by means of screens and blankets, and the temperature of the room should be kept at about 70° F. A bronchitis-kettle,[1] containing perhaps a teaspoonful of friar's balsam in the water, acts beneficially by keeping the air moist. Sometimes two kettles may be used. Over the tube is placed a layer of gauze, wrung out of warm antiseptic lotion, and anything ejected by the tube must be at once brushed away by the nurse. The inner tube should be frequently changed, say every twenty or thirty minutes, and thoroughly rinsed in carbolic lotion, and its interior cleansed with a feather, of which a plentiful supply is needed. The tube may also be cleared with a feather without removing it. The tube is changed and another one substituted at the end of twenty-four hours or later, as the surgeon may think fit. The tube is discarded as soon as the patient can breathe naturally, when the wound soon closes. Feeding should be frequent at first, and must consist of beef-tea and milk, with brandy if necessary, as it usually is.

Laryngotomy. In the operation of laryngotomy, which is performed in cases of the greatest urgency, the larynx is opened in a little space between the thyroid and cricoid cartilages which is covered in by a membrane—the crico-thyroid membrane. Laryngotomy is a quicker and easier operation than tracheotomy, and in adults for this reason it is preferred by many in an emergency. In children it is not suitable, since the space is too small through which to pass a tube. It may be necessary to perform laryngotomy with any knife that may happen to be at hand, when the patient is dying from suffocation. The after-details do not differ materially from those already mentioned under tracheotomy. Operations on the thyroid gland and on the œsophagus need not detain us. The œsophagus occasionally is opened (œsophagotomy) when a foreign body, such as a set of false teeth, has become impacted in the tube.

Operations for empyema. Turning now to the chest, operations for empyema, or pus in the pleural cavity, must be referred to. The pleural cavity may be simply opened and drained, or a portion of

[1] The kettle should never be filled more than two-thirds full, and the spout must not be directed in front of the patient's face.

one or more ribs may be also removed, to allow of free access to the cavity and evacuation of the pus (see chapter xxiv.). Probably an exploring-needle or aspirator will have been used to ascertain the presence of pus before an operation is undertaken for its removal.

The patient lies on his back close to the edge of the table. An incision is made transversely in the selected spot, and a director pushed into the pleural cavity. The opening made may now be enlarged with dressing-forceps or the finger, when the pus will escape. A low opening is usually chosen to facilitate drainage. In the case of removal of a portion of one or more ribs a raspatory and bone-forceps will be required, also a saw. An exploring-trocar should always be at hand. The drainage-tubing should be fully a third of an inch in calibre, and a good method to adopt is to split one end longitudinally and stitch the sides to a thick layer of gauze. Some means must be adopted to prevent the tube slipping into the pleural cavity. A thick layer of dressings will be necessary to absorb the pus, which will at first be very copious.

Where irrigation of the cavity is required the nurse will prepare warm perchloride lotion (1-5000). Protective or gauze may be used to place round the tube, which must be covered with several layers of cyanide or sal-alembroth gauze. The tube will be gradually shortened as the discharge diminishes.

At first the case will probably require dressing in a few hours. The nurse must be most careful to employ antiseptics in handling and dressing the case. It will be advisable to sponge the chest with the antiseptic lotion when the case is dressed. The diet must be generous, but light and easily digestible. The temperature chart will furnish the best evidence as to the progress of the case. The nurse should note that the discharge should be perfectly sweet soon after the operation.

Chronic empyema. Some cases of chronic empyema are most troublesome to treat, and in these cases we cannot expect the compressed lung to again completely expand. Fortunately cases of chronic empyema are now becoming much less common than heretofore. Cases of chronic empyema are sometimes left alone. Where operation is decided upon one of the methods already referred to is adopted.

In speaking of abdominal operations we can only take up very briefly the consideration of the commoner operations, and we shall commence by describing the operation of ovariotomy.

Ovariotomy. Ovariotomy is an operation which has within the last few years been brought to a very high standard of perfection, and the nurse must be fully acquainted with the management of these cases. The operation is undertaken to remove tumours of the ovary, which generally take the form of a large sac containing gelatinous material (cystic tumour). These tumours may be single or multiple, and may grow to an enormous size. Tapping these cysts can only give temporary relief, and is now generally undertaken only for diagnostic purposes.

The requisites for ovariotomy may be enumerated under (*a*) dressings and general requirements, and (*b*) instruments. All preparations must be undertaken on the previous day, and the instruments must all be thoroughly boiled.

(*a*) An ovariotomy mackintosh must be prepared, with an oval opening to correspond to the incision. The opening is fixed *in situ* with plaster. At least twelve sponges must be at hand, one large flat one for the abdominal contents. These should be reserved for ovariotomy cases. A plentiful supply of dressings, with a many-tailed flannel bandage, must be prepared.

(*b*) The instruments required are ovariotomy-forceps (Nélaton's), Spencer Wells's trocar and tubing with a receptacle to hold the fluid, scalpels, probe-pointed bistoury, spatulæ, scissors, blunt hooks, dissecting-forceps, twelve pairs of artery-forceps, needles on handles, needle-holders, mirror, drainage-tube, both glass and rubber.

The usual preparation of the patient is carried out, as already detailed.

The operation consists in (1) the incision; (2) the emptying of the cyst with the trocar; (3) drawing of the cyst out of the abdomen; (4) the separation of the adhesions, many of which require ligature before division; (5) the treatment of the pedicle or "stalk" of the tumour—this is usually ligatured, the material used being strong carbolised silk or whipcord. A needle on a handle is threaded with the ligature, which should be about three feet long, and is made to transfix the pedicle. The double ligature is then

divided, and the pedicle is tied in two halves. The cyst is then cut off close to the ligature. (6) The abdominal cavity is then cleansed by a sponge, or washed out with warm boracic or weak carbolic lotion (1-100), or simply boiled water or saline solution. The nurse should have plenty of the selected fluid in a jug, as a large quantity may be required. Before closing the wound all instruments and sponges must be counted. When drainage is required, a glass tube (Keith's) is placed at the lower angle of the wound, and the end covered with a sponge, which is changed when it becomes soaked. The wound is dressed in the usual way.

Regarding the after-nursing, the nurse will give her whole time to the patient. She will keep a regular report of temperature, pulse, respirations, passage of catheter and quantity of urine, and actions of the bowels; the nourishment taken, sleep obtained; also any complications, such as vomiting and accumulation of flatus (tympanitis). For the first twelve hours nothing must be given except morsels of ice to relieve thirst, or sips of hot water, which often gives more relief. After twenty-four hours milk and beef-tea may be added. Nutrient enemata may be given when sickness persists, a not uncommon complication. The patient must be enjoined to lie as quietly as she can on her back, and a cradle should be used to take off the weight of the bed-clothes. If all goes well, the wound will not be dressed for a week or more, when healing by first intention will probably have occurred. When a drainage-tube is used, the wound must be dressed as often as is necessary, according to the quantity of discharge. Before the patient leaves hospital she will probably be measured for an abdominal belt, to support the weakened abdominal wall (see chapter xx.).

Having described the operation of ovariotomy, it will only be necessary to refer very briefly to other abdominal operations. In all cases of abdominal section the opening of the abdomen, the cleansing of the cavity, and the closure of the wound are conducted on much the same lines, whatever be the condition requiring the operation, and the instruments referred to under ovariotomy, with the exception of the trocar and cannula and Nélaton's forceps, will be required, as well as instruments special

to the particular operation performed. The dressings will also be the same as those mentioned. The abdomen is usually opened in the middle line of the body, between the umbilicus and pubes.

Operations on the stomach. Operations on the stomach are undertaken as a rule for cancer either of that organ or of the œsophagus, which prevents the swallowing of food, either partially or entirely. In the latter case a mouth is made in the stomach (gastrostomy), through which nourishment is introduced by means of a catheter or a larger tube: the organ is fixed to the abdominal wall, and opened at the time or at a later period, when the operation is performed in two stages. The pyloric end of the stomach, together with a portion of the duodenum, is occasionally removed in cases of cancer. Lastly, an opening may be made between the stomach and some part of the small intestine (jejunum) in cases of constriction of the pyloric orifice.

Operations on the gall-bladder and spleen Operations are performed on the gall-bladder, which may be opened to remove biliary calculi or removed. The spleen has occasionally been removed in cases of enlargement and disease, sometimes with success.

Operations on the kidney. The kidney may be explored either for stone or other disease (nephrotomy) ; it may be removed (nephrectomy) ; lastly, when movable, the organ may be stitched to the body-wall (nephrorrhaphy). For operations on the kidney for stone the special instruments required are probes, scoops, small bladder-sound and small lithotomy-forceps, and a long tenotomy-knife. The kidney may be reached from an incision either in the loin or in the anterior abdominal wall on the corresponding side.

Operations on the intestines (not the rectum). The intestine, large or small, may be opened, or a portion may be removed. The only operation, however, involving the intestine (apart from operations for hernia and those performed on the rectum) to which we need refer is that known as colotomy, in which an artificial anus is established in some part of the colon.

Colotomy. Colotomy may be performed on the ascending or descending colon, and in the loin (lumbar colotomy) or in the groin (inguinal colotomy). In operations both on the kidney and on the colon from the loin the peritoneum is not implicated, whereas in operations on these organs from the front of the body the peritoneum is opened. Colotomy

is in nearly every case performed on the descending colon, which, it will be remembered, passes down on the left side of the abdomen.

Left lumbar and left inguinal colotomy.

We shall speak of (1) lumbar colotomy, and (2) inguinal colotomy. For lumbar colotomy the additional instruments required are tongue-forceps for the gut and the special needles known as Hagedorn's. In inguinal colotomy these same instruments, together with those enumerated for opening the abdomen, are necessary.

(1) In lumbar colotomy the patient is placed on his right side, with firm pillows or sand-bags under the loin, to render prominent the left lumbar region. The steps in the operation are (*a*) the incision, (*b*) the finding of the colon, (*c*) the stitching of the colon to the skin, and (*d*) the opening of the colon. The last step may be deferred for some hours, or even for a day or two.

(2) In inguinal colotomy the patient lies on his back. As has been said, the colon is opened in the left groin in that portion of its course known as the sigmoid flexure. The steps of the operation are the same as in lumbar colotomy, but here the bowel is opened from the front. The opening of the bowel in this operation is usually deferred for some days.

An antiseptic dressing is applied over the bowel in both cases in the usual manner.

Object of colotomy.

The object in colotomy is to allow the bowels to be evacuated through the colon either anteriorly or posteriorly; and the condition for which these operations are undertaken is usually cancer of the rectum, which sooner or later gives rise to symptoms of partial or complete obstruction of the bowels. As a rule inguinal is preferred to lumbar colotomy, one reason being that the groin is a more convenient situation for an artificial anus.

After-treatment.

Regarding the after-treatment of colotomy, the bowels are kept confined for a few days by opium, and the same points regarding the diet observed as have been referred to under ovariotomy. In lumbar colotomy the patient will not be able to take charge of the artificial anus, as in the case of inguinal colotomy. The bowel beyond the wound is kept clear by enemata, and an effort is generally made during operation to prevent the contents of the gut from passing downwards beyond the artificial anus.

Hysterectomy, abdominal and vaginal. Removal of the uterus may be performed through the abdomen (abdominal hysterectomy) or through the vagina (vaginal hysterectomy). The former operation will necessitate the use of the same instruments as for ovariotomy, the special trocar and cannula being exchanged for a serre-nœud, which may be described as an instrument holding a loop of strong wire or whipcord, which is made to surround the organ or growth to be removed, and gradually tightened by means of a handle or screw.

In the case of vaginal hysterectomy, which is the operation usually selected in cancer of the uterus, the patient is placed in the lithotomy position. Clover's crutch is useful for retaining the patient in this position.

Instruments. The instruments required include Sims's speculum (duck-bill), volsella, scissors with long handles, retractors, needles as in ovariotomy, together with the other general instruments and appliances, which must include small sponges in holders, gum elastic catheter, and material to pack the vagina, such as iodoform gauze.

The operative treatment of hernia must now occupy us; and to understand this it will be necessary to go rather more into detail than we have hitherto done.

Hernia. By a hernia is meant the escape of an organ or part of an organ from the cavity in which it lies. Although we speak of hernia of the brain and its coverings, for instance, yet the word, used alone, refers to the abdomen and pelvis. Popularly the condition is known as rupture. A hernia may consist either of bowel or omentum (by which we understand the folds of peritoneum which cover the viscera and the fatty tissue contained in them), or both.

Contents and sac of a hernia. The contents are enclosed in the sac of the hernia, which consists of a pouch derived from the peritoneum that lines the abdominal cavity.

Reducible, irreducible, and strangulated herniæ. Herniæ are spoken of as "reducible" when they can be reduced or replaced; "irreducible," when they cannot be so returned; and "strangulated," when the bowel or omentum or both are tightly nipped by the edges of the opening through which it has passed, and the circulation is consequently obstructed, with severe and even fatal results.

Herniæ are also named according to their position. We need only mention three varieties: (1) inguinal, (2) femoral, and (3) umbilical.

(1) Inguinal hernia may be present at birth or may be acquired. There is a swelling in the groin, which may or may not be reducible. **Inguinal hernia.**

(2) Femoral hernia is never congenital. It presents itself as a tense swelling at the inner and upper part of the thigh. **Femoral hernia.**

(3) Umbilical hernia is common in infants and again in elderly stout females. In infants the hernia is usually easily reducible, in adults it sometimes cannot be entirely reduced. **Umbilical hernia.**

The symptoms of strangulated hernia should be known by the nurse. Of these the two chief are vomiting, which, at first consisting of the stomach contents, before long becomes fæcal; and constipation, which is usually complete, without the passage of flatus. There is pain, usually at the seat of hernia, and the symptoms of collapse are more or less marked, with an anxious, pinched expression. The history usually obtained is that of a rupture, which has generally been neglected and allowed to come down. **Symptoms of strangulated hernia.**

Finally we must refer to the treatment of herniæ in general. The reducible hernia may be operated on, when what is known as a "radical cure" is performed. This consists in closing the opening through which the hernia has travelled. In most cases, however, the patient will not consent to an operation; and providing he will submit to wear a truss, an operation is not necessary. Trusses are considered in the next chapter, to which the nurse should refer. **The treatment of herniæ. Reducible.**

An irreducible hernia is always a source of danger, from its liability to become strangulated. For this reason every effort is made to render it reducible by manipulating the mass in the recognised way (taxis), aided by rest in bed, with a saline purge and low diet. Occasionally a specially devised truss may be applied to hold the hernia. Sometimes the "radical cure" may be undertaken. **Irreducible.**

There must be no delay in attending to a case of strangulated hernia. Probably already efforts have been made to "reduce" the hernia, and these cannot long be persisted in. Under these circumstances the nurse must make immediate preparation for an operation. The patient is placed under an anæsthetic, leave having been previously obtained by the surgeon to act as he thinks best. Under an anæsthetic, with relaxed muscles, the hernia not uncommonly becomes **Strangulated. Taxis.**

Hot bath. reducible. Before, however, giving an anæsthetic it is sometimes beneficial to attempt reduction in a hot bath. This should then be got ready by the nurse as quickly as possible. Where there is delay in operating arising from any cause, opium is given and a fomentation or carbolic compress applied to the hernia.

Herniotomy. The operation for relieving the constriction in strangulated hernia is known as herniotomy. The patient having been previously shaved, etc., the steps of the operation are: (1) the incision, the exposure, and opening of the sac; (2) the division of the constriction; (3) the examination and treatment of the contents of the sac; (4) the treatment of the sac itself, and the closure of the wound.

The intestine may be gangrenous from the long-continued cutting off of its blood-supply, when it cannot be returned into the abdomen, but must be either removed or placed in the mouth of the wound. Gangrenous omentum is ligatured with strong carbolised silk and cut off, the stump being returned into the abdominal cavity. The sac may be left alone or made use of in the radical cure, which is now usually undertaken at the same time as herniotomy.

Special instruments. The special instruments required for herniotomy are the hernia-knife (which is a probe-pointed bistoury, with only a very small cutting-edge), directors, and needles in handles, specially curved, for closing the edges of the opening. The usual antiseptic dressings are applied, and the special form of bandage known as the "spica" (see p. 211).

After-management. Opium or morphia will be required to relieve pain, to procure sleep, and to keep the bowels at rest. Sips of hot water or morsels of ice must alone be given by the mouth for twenty-four hours, the strength being supported by nutrient enemata and suppositories. After this period milk and beef-tea may be allowed, but no solid food until the bowels have acted spontaneously. If the constriction has merely been divided, and the opening through which the hernia has come has not been closed by one of the methods of radical cure, a truss must be worn as soon as the patient begins to get about again.

Operations on the bladder. Operations on the bladder are undertaken for stone, for tumour, and for removal of part of the prostate gland, which

in the male surrounds the neck of the bladder, and is very apt after middle life to cause retention of urine. The bladder may be opened (1) above the pubes (supra-pubic cystotomy) or (2) through the perineum.

Supra-pubic cystotomy. (1) Supra-pubic cystotomy is usually performed for stone in the bladder, when of large size. The term lithotomy is applied to operations for stone in the bladder.

Instruments. The special instruments required for supra-pubic cystotomy are sharp and blunt hooks, broad retractors, sounds, lithotomy-forceps, and scoop; also catheters, a rectal bag, and a syringe.

Rectal bag. When the patient is anæsthetised, the rectal bag, smeared with oil or vaseline and empty, is passed into the rectum. The object of this pear-shaped rubber bag is to lift up the bladder out of the pelvis, so as to render it more accessible. This bag is provided with a tap. The urine is drawn off with a catheter, and the bladder is washed out through the catheter with warm boracic lotion. For washing out the bladder a syringe may be used, but a glass funnel with rubber tubing attached is more convenient. The bladder is now filled with the lotion. From about three ounces in young children up to from twelve to fifteen in adults are the limits. A piece of drainage-tubing tied round the penis prevents this escaping. Next, the rectal bag is filled, about the same quantity of warm water being used.

The steps of the operation. The incision is now made, and the bladder-wall defined and transfixed with a sharp hook. It is then opened and explored, the lotion being now allowed to escape. The stone is removed with the lithotomy-forceps or the scoop and finger. Sometimes a drainage-tube is introduced, and the patient lies on his side to allow the urine to drain away, or the wound is closed. If the operation be undertaken for tumour of the bladder or for enlargement of the prostate gland, the steps of the operation up to the opening and exploration of the bladder remain unchanged.

Use of the sound. We have not yet mentioned the sound in connection with the operation. Generally the presence of a stone will have been definitely determined before the operation, but the sound is usually introduced into the bladder after the patient has been anæsthetised, to confirm the diagnosis and to learn as much as possible about the size, consistence, and number of the stones (if there be more than one).

The sound is retained in the bladder by some surgeons during the operation as a guide.

Perineal lithotomy. (2) Perineal lithotomy is performed with the patient in the lithotomy position.

Instruments. The instruments required include a lithotomy-knife, lithotomy-forceps, scoop, lithotomy-tube, sound, a grooved "staff," with the groove on the left side if "lateral lithotomy" is to be performed, and with the groove in the middle line when the bladder is opened through the middle line of the perineum. Clover's crutch should also be at hand. To check bleeding from the deeper part of the wound there is often required what is known as a petticoated tube. A rigid tube is taken, and round its deep end is firmly tied a piece of lint or oil-silk, so as to form a petticoat. This is then filled with gauze or other material packed firmly round the tube. The nurse should prepare it beforehand, and have it in readiness.

Petticoated tube.

Steps of the operation. In this operation the "staff" is introduced into the bladder as soon as the patient is "under," and after the bladder has been distended with warm boracic lotion, as before described. The stone is struck with the staff, and its presence verified. It is then entrusted to an assistant, who holds it in a special position, and on no account leaves hold of it until the time comes for its withdrawal from the bladder. The incision is now made, in the case of "median lithotomy" in the middle line of the perineum, in "lateral lithotomy" to the left of the middle line. The finger is introduced into the wound, and the groove in the staff felt for. The point of the knife is next pressed into the groove, and made to pass on into the bladder. The finger is now introduced into the bladder, and the stone felt; then the forceps are passed in, the finger and sound are withdrawn, and the stone seized with the blades of the forceps and extracted. The wound is powdered over with iodoform, the lithotomy-tube introduced and fixed in position with tapes. The petticoated tube is only required in the case of hæmorrhage from the deeper parts of the wound. As a rule no dressings are applied. The urine should come freely from the wound, and this the nurse must assure herself of. The only other point in the nursing is to keep the patient scrupulously dry and clean. The diet must be light and the bowels regulated. In a few days the urine

will pass in part by the urethra, and the wound will gradually heal up from the bottom.

Lithotrity. Sometimes stones are crushed by an instrument known as a lithotrite, which is passed into the bladder like a catheter. This operation, which is now frequently performed, is known as lithotrity, and is indicated when the stone is not too hard nor too large, and when other conditions are favourable. For the performance of lithotrity one or more lithotrites, an evacuating-catheter, and aspirator are required. The two latter instruments are to remove the *débris* of the crushed stone or stones.

Stone in the female. In the female small stones may be removed through the urethra. Larger stones may be crushed by the lithotrite, or removed by lithotomy, performed through the vagina. Stones too large to be thus dealt with are removed by the supra-pubic operation.

In concluding our account of some of the commoner operations we shall say a few words about operations on the rectum.

Operations on the rectum. The commoner affections of the rectum for which operations are performed are hæmorrhoids (piles), fistula, fissure, and cancer.

Preparatory measures. In any operation on the rectum it is well to keep the patient at rest in bed for a day or two prior to operation. An aperient must be given the night before, to be followed by a copious enema in the morning.

Hæmorrhoids. Hæmorrhoids requiring operation may be dealt with in various ways. We shall briefly refer to two: (1) the clamp and cautery; (2) ligature.

Internal and external. The hæmorrhoids may be within the anus (internal) or outside (external). In the latter case they may consist partly or entirely of redundant folds of skin.

Operation. The patient is placed in the lithotomy position, and the sphincter is stretched; this causes a temporary loss of control over the bowels, which, however, is soon recovered from.

Clamp and cautery. (1) For the first method a volsellum and clamp and cautery are required. The piles are seized with the volsellum, the clamp is applied, and the pile seared off by the cautery, which is applied at a dull-red heat. Pacquelin's cautery is the most convenient instrument for the purpose. The nurse should heat the point in the upper part of the

flame of a spirit-lamp, and as soon as it becomes red-hot she must compress the bulb on the rubber tubing which vaporises the benzole. She keeps the point at the required heat until the surgeon is ready to use it. The actual cautery may be used, the cautery-iron being heated in the fire.

Ligature. (2) For the second method forceps to hold the pile, scissors, and strong silk are required. The piles are ligatured in turn and cut off.

The parts after operation are dusted with iodoform; a pad of wool is adjusted and kept in place by a T-shaped bandage. Usually a morphia suppository is introduced into the rectum after the operation. The bowels are kept confined for a few days with opium. Retention of urine is common after operations on the rectum, and must be relieved by the catheter.

Fistula. A fistula usually requires an operation. The method of treatment generally adopted consists in opening up the fistulous track or tracks, for there may be several, and allowing them to heal up from the bottom. Bistouries, sharp- and probe-pointed, also a director and probe, are required. Oiled lint makes a good dressing. A pad of wool and a T bandage are applied in the usual way.

Fissure of the anus. Fissure of the anus, which consists in a painful crack just inside the sphincter muscle, is dealt with by stretching the anus transversely with the two thumbs placed back to back, under an anæsthetic.

Cancer of the rectum. Cancer of the rectum, if not too far advanced, is treated by excision, in part, of the rectum. Curved and straight bistouries, scissors, scalpels, volsella, rectal speculum, cautery, and sponges in holders are the chief requisites. The wound is usually plugged with iodoform gauze. Sometimes the coccyx and part of the sacrum may have to be removed to obtain free access to the cancerous growth.

CHAPTER XX.

BANDAGING—SOME OF THE COMMONER SURGICAL APPLIANCES.

THE art of bandaging neatly and correctly cannot be learnt from any book. This is a part of the nurse's training which must be essentially practical. All that will be here attempted will be to say a few words about bandaging in general, referring to some of the special bandages in common use. **Bandaging.**

Many materials are used for the purpose; of these calico, domett, flannel, and gauze are the chief. **Materials.**

The common type of bandage is the roller. We speak of the roller as the head and the free end as the tail of the bandage. **Roller-bandage.**

In making bandages it is usual to procure the material and to mark off the various widths required, varying from an inch for the fingers and toes to about four inches for the trunk. The length is usually about six yards. The strips are torn and wound, either with the fingers or by a machine. **Making bandages.**

In winding with the fingers the bandage should be wound evenly and tightly. All threads are removed from the edges, and the tail secured either with a pin or a few threads wound round the roller. Where many bandages are required a bandage-roller is useful. One end of the bandage is fixed round the central rod, not too tightly, or the roller cannot easily be removed. The handle is then turned, and the bandage evenly and firmly wound as before. **Winding bandages.**

Having freed the tail, the nurse proceeds to apply the bandage—the one selected being of suitable width, say 2 to 2½ inches for the upper limb, the same for the head, rather wider for the lower limb (3 to 3½ inches), and about 4 inches for the body. **Application of bandages. Their requisite width.**

Rules for bandaging. There are a few rules which should be adhered to in bandaging. These are well summarised by Mr. Caird in his surgical handbook :—

(1) Fix the bandage.

(2) Bandage from below upwards, from within outwards over the front of the limb.

(3) Use equable pressure throughout.

(4) Let each succeeding turn overlap two-thirds of its predecessor.

(5) Keep all the margins parallel, and let the crossings and reverses be in one line, and rather towards the outer aspect of the limb.

(6) End by fixing the bandage securely.

Spiral. **Reverse.** **"Figure of eight."** In bandaging the limbs we have to make use of two methods in addition to the ordinary spiral. So long as we have to bandage a more or less cylindrical part of the body the spiral is suitable; but when the member is not cylindrical, but tapers after the manner of a cone, we must employ a reverse. Again, in order to fix the bandage we adopt the plan of making a loop, which is known as a "figure of eight."

Bandaging of the hand and forearm. As an example we shall take the hand and forearm : the arm is kept supine (palm upwards), and firmly stretched out. The tail is placed at the root of the first finger; the bandage is carried across the palm of the hand to its inner side, round the wrist, back to the root of the little finger, and across the back of the hand to the starting-point. This forms the figure of eight, and fixes the bandage. The fingers and thumb are left exposed, and the bandage is continued upwards. But we find the hand is not quite cylindrical, and in order to make the bandage lie evenly we have to employ the reverse. To do this free about three inches of the bandage, holding the roller lightly, and with the first finger of the left hand fix the lower end of the bandage; then make a fold in it by pronating the roller, so that the under or posterior side of it now comes to occupy the upper or anterior side. We continue to reverse until we come to the wrist. After a few spirals we have again to adopt the reverse as the forearm begins to taper. Finishing off the bandage at the required spot, we secure it either with a pin or by splitting the end into two strips, and tying them round the limb.

The foot is bandaged on the same plan as the hand. A figure of eight is formed by laying the tail of the bandage over the root of the great toe on its upper aspect, and carrying it across the foot to the outer side of the ankle, round the ankle, back across the front of the foot to the root of the little toe, and under the sole of the foot to the starting-point. After thus fixing the bandage a simple turn is taken at the roots of the toes; but as the foot is not cylindrical, the reverse must be substituted for the spiral. The reverses are continued until we approach the heel, when the figure of eight is once more employed. Passing round the ankle, we cross over the front of the foot, under the sole, and bring the roller up on the inner side, again over the front of the foot, and back to the starting-point. When the ankle is covered in, a few spirals are taken round the leg; but as we approach the calf the cylindrical shape is once more lost, and reverses must be adopted until the leg is covered in.

Bandaging the foot and leg.

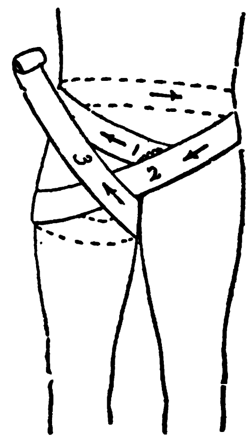


FIG. 45.—ASCENDING SPICA OF THE GROIN.

The nurse should seize every opportunity to obtain practice in bandaging, and this she can usually manage by making use of a colleague. From this she will learn far more than from any description. The left limb should be chosen, as it is easier to bandage with the right hand than with the left. The bandage should be applied at the same time as the nurse reads, and the various manipulations performed.

Special bandages.

We shall now refer to some of the special bandages, commencing with the spica of the groin. It is so called from the resemblance to an ear of wheat, produced by the crossings of the bandage. The spicæ of the groin are known as ascending and descending, and are commonly used in cases of hernia and to retain dressings in the groin.

Spicæ of the groin.

Ascending spica. (1) Ascending spica. The tail of the bandage is placed over the seat of rupture, and the bandage carried round the body back to the starting-point. The second loop is formed by taking the roller across the front of the thigh to its outer side, into the perineum, and back again to the starting-point. These turns are repeated, passing from below upwards, so that each crossing is higher than its predecessor.

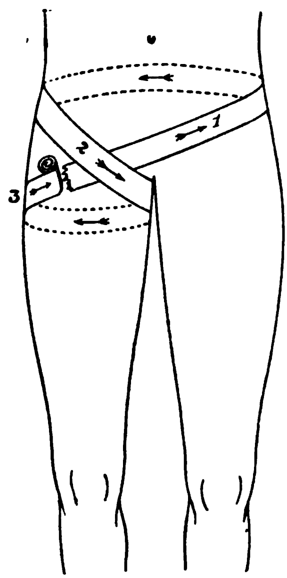


FIG. 46.—DESCENDING SPICA OF THE GROIN.

Descending spica. (2) Descending spica. Here we commence as before, but in the opposite direction. Taking a turn round the body, we return to the starting-point. Next the roller is taken across the front of the thigh from the outer to the inner side, into the perineum, and back round the outer side of the thigh to the starting-point.

If we compare the two diagrams, we shall see that the bandage passes down into the perineum on the outer side, and comes up on the inner in the case of the ascending spica. In the descending spica the direction is reversed, and here the crossings overlap from above downwards.

Bandaging the head: the knotted bandage. In bandaging the head the knotted bandage is commonly used. The tail is freed and grasped in one hand, and the roller is carried round the head horizontally, commencing behind the ear, passing round the forehead, and low down at the back of the head to the starting-point. Having completed this turn, the roller is carried beneath the free tail, and taken across the top of the head at right angles to the first loop. This loop passes under the chin, and, coming back to the tail of the bandage, the second loop is completed. The loops are securely fixed by the tail which has been left free.

We have now divided the scalp into two divisions—one in front of the transverse loop, and one behind it. We now proceed to cover in the scalp in whole or in part as is required, each loop overlapping the one before it and

FIG. 47.—KNOTTED BANDAGE OF THE HEAD: BEGINNING (CAIRD AND CATHCART.)

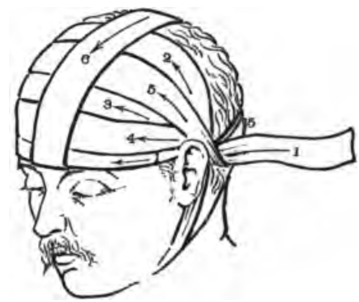


FIG. 48.—COMPLETED KNOTTED BANDAGE (CAIRD AND CATHCART).

playing round the free edge of the bandage. On completing it, the end is secured by fastening it to the tail. A good deal depends on the shape of the head in applying this bandage neatly. The turns under the chin should not be too tight.

The capeline bandage.

The capeline bandage, which is used by some to cover in the whole scalp, is a firm bandage, but it has the disadvantage of being very hot and apt to cause headache. The nurse should be able to apply it, as it is sometimes required. A light material should be selected, such as gauze or butter-cloth. Two rollers are taken, their tails loosened and tacked together. One roller should be longer than the other, as the horizontal turns require a greater length of bandage than the vertical. Standing behind the patient with a roller in each hand, the larger one in the left, the bandage is commenced at the root of

FIG. 49.—BEGINNING THE CAPELINE BANDAGE, VIEWED FROM BEHIND (CAIRD AND CATHCART).

the nose, and the rollers carried horizontally backwards to the lower part of the back of the head. Changing hands here, the smaller roller is now carried vertically forwards over the top of the head to the root of the nose, and this vertical turn is covered in and fixed by the horizontal turn of the larger roller, which circles round the head. These turns are now repeated, the smaller roller being carried backwards again from the root of the nose to the back of the head, but this time slightly to one side of the middle line, and so on until the scalp is covered in, in each case the horizontal fixing the vertical turn. The nurse should be careful to let the vertical turns come well down over the root of the nose and over the back of the head respectively.

FIG. 50.—CAPELINE BANDAGE, FROM THE FRONT (CAIRD AND CATHCART).

Bandaging the eye.

In bandaging the eye the first turn is taken horizontally around the head above the level of the ears, commencing just above the eyebrow of the eye which is to be left exposed. Returning to the starting-point, the next turn passes over the eye to be bandaged, which is protected by a pad of absorbent cotton-wool or other application, and under the ear of the same side. The bandage is thus tightly fixed. It is important that the first turn pass above the ear and the second below it. The bandage is finished off in the usual way.

FIG. 51.—BANDAGING THE EYE (CAIRD AND CATHCART).

Bandage to secure the arm to the chest.

The next bandage to which we shall refer is that which is used to secure the arm to the chest—for example, in the case of a fractured clavicle, or after removal of the breast. Let us suppose we wish to fix the right arm to the chest

in the case of a man suffering from a fracture of the right clavicle. A pad of wool is placed in the axilla and the right hand on the left shoulder, the elbow being held close to the side. Skin-surfaces must not be allowed to remain in contact with each other, but must be separated by layers of cotton-wool. The tail of the bandage is placed just below the right hand, and the roller carried round the chest from left to right and back to the starting-point. The next turn corresponds with its predecessor, but is taken at a slightly lower level. The third turn crosses the chest at a still lower level, and passes over the elbow, and is carried obliquely upwards across the back to the left shoulder, which it crosses, descending across the front of the chest once more to the elbow, under which it passes. The roller is now carried straight up the back to the right shoulder, downwards to the elbow, running parallel to the humerus: passing under the elbow, the next turn runs up to the left shoulder, which it crosses, and down over the hand, where it ends. The diagram (fig. 52) will explain the various turns and the spots where safety-pins must be inserted to keep the whole in position. It is best to stitch the crossings thoroughly, to prevent the bandage from slipping.

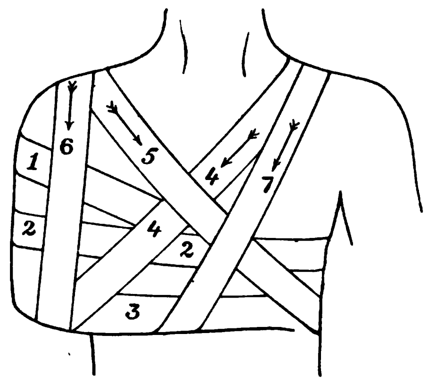


FIG. 52.—BANDAGING FOR FIXING ARM TO THE CHEST, AS IN CASES OF FRACTURED CLAVICLE OR AFTER REMOVAL OF THE BREAST.

We have so far been concerned with the roller-bandage, but must now turn to a few other types of bandage.

The three-tailed or T-bandage. The three-tailed or, as it is more commonly called, the T-bandage consists of a transverse and a vertical piece:

the former should be about five feet long, the latter about three feet. The vertical piece is tacked to the transverse, and may be split, or there may be two pieces. It is used to retain perineal dressings: the transverse piece passes round the lower part of the trunk, and the vertical portion downwards through the perineum to be attached to the former in front. This bandage can be applied to the face, when a transverse slit is made in the transverse segment for the mouth, and a vertical slit in the vertical segment for the nose.

The four-tailed bandage for fracture of the lower jaw.

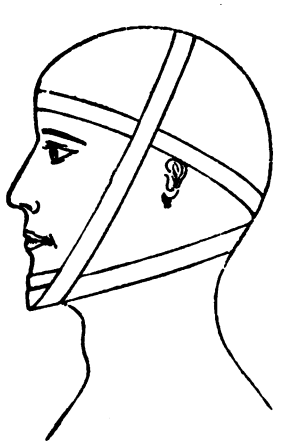


FIG. 53.—FOUR-TAILED BANDAGE FOR FRACTURE OF LOWER JAW.

The four-tailed bandage (fig. 53) is the common method of treating fracture of the lower jaw. The bandage taken should be about a yard and a half long and three inches wide. Tearing from each edge towards the centre, a portion is left intact, in which a transverse slit is made nearer the upper than the lower end of the bandage. This slit is for the chin. The lower ends of the bandage are brought upwards and tied over the top of the head: the upper ends are tied low down at the back of the head, and the ends of the two knots may be fastened together, to render the bandage still more secure.

Four-tailed bandage for the head.

The following is another variety of the four-tailed bandage, which is useful for covering the top or back part of the head. A piece of bandage about two feet long and eight inches wide is taken. The centre third is left untorn; the terminal thirds are torn into two tails respectively. The centre of the untorn portion is placed over the top of the head from front to back; the anterior tails are tied at the back of the head, and the posterior tails under the chin.

Six-tailed bandage.

A larger area may be covered by taking a strip of bandage a yard long and a foot wide, and splitting the terminal thirds into three tails instead of two, thus forming a six-

tailed bandage. The untorn part is placed over the top of the head as before, the middle tails are tied under the chin, the anterior under the back of the head, and the posterior on the forehead.

The many-tailed bandage.

The many-tailed bandage may be used either for the trunk or the limbs. Its chief value lies in the fact that it can be applied and undone without moving the body or the limb. Hence its value in retaining the dressings after abdominal operations and in wounds of various kinds. The bandage consists of a central vertical strip, which is applied to the backbone or to the back of the limb, as the case may be. To this central strip are attached several transverse pieces, which are made to overlap. These transverse strips are folded over, beginning from the lower end, the last pair being secured to their predecessors with pins. These bandages are usually made of flannel or domett.

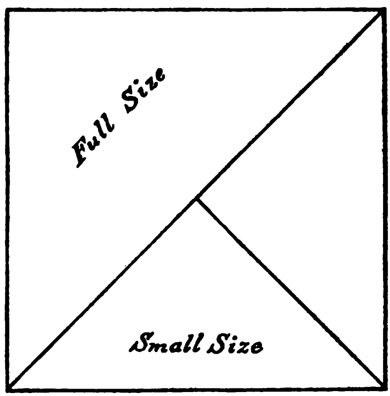


FIG. 54.

The triangular handkerchief.

Leaving bandages, we must now turn to the triangular bandage or sling (fig. 54). This is a most useful appliance, and is easily washed. Various sizes may be used. A good rule in using the triangular handkerchief is to apply the base to the part which is to be supported. This is shown in the diagram (fig. 55), where the base of the sling is applied to the elbow which it is desired to support. The corner A hangs over the right shoulder. B is brought up over the elbow, across the chest, and fastened to A round the neck in a reef-knot. C is tucked up and pinned in position. Thus the right arm is supported from the elbow. The hand or foot may be covered with the triangular handkerchief; also the shoulder, hip, and the head. In some cases it is convenient to have two slings, one being tied as a cravat, to

act as a fixed point. This applies to the shoulder and hip. A piece of calico from three to four feet square should make a couple of triangular handkerchiefs.

Splints. When speaking of fractures and their treatment, we had occasion to refer to splints; but the nurse must not forget that, inasmuch as the primary object of a splint is to give rest and support to an injured or diseased part, the indications for their use are numerous, and their shape and consistence vary according to the part of the body to which they are to be applied, and to the special object which they are to fulfil. We shall refer more especially to some of the special splints and their application, but a few words about splints in general will be required. Splints may be made of plain wood, gooching, pasteboard, tin, lead, or iron. Poroplastic or leather is more rarely used.

FIG. 55.—TRIANGULAR HANDKERCHIEF IN POSITION, READY FOR FIXING.

Gooching. Gooching is very useful in the case of fractures, as it can be moulded to the limb, and is easily cut into any shape. It consists of strips of light wood glued to some form of webbing, and is supplied in rolls.

Poroplastic. Poroplastic forms an admirable splint, but is expensive. It consists of felt impregnated with resin. It is cut into the desired shape, and soaked in hot water or held before the fire, when it becomes pliable, and is easily moulded to the limb.

Pasteboard splints. Pasteboard often makes a useful material for splinting, especially in young children. It can be easily cut and shaped as desired.

Wooden splints. Wooden splints are often hollowed out and hinged in the case of angular splints, so that by means of a screw they may be adjusted to any angle required.

Rattan-cane is often used to make splints. **Rattan-cane.**

The Crimean splint (fig. 56) is occasionally used. Three long narrow strips of metal are taken and fixed to a thin cushion, as shown in the diagram. The author has had no experience of their use. **Crimean splint.**

In the application of splints the two important points to bear in mind are to pad them carefully with some soft and elastic material, and to avoid any pressure on bony points by shaping them accurately to the part. In fracture of the lower end of the radius, which is associated, as we have seen (p. 146), with the name of Colles, certain special splints have been devised, as best adapted to counteract and remedy the displacement of the fragments, but many surgeons prefer the ordinary splints, suitably shaped and padded.

FIG. 56.—CRIMEAN SPLINT, PADDED.

Gordon's splint (fig. 57) consists of a splint for the anterior **Gordon's splint.**

FIG. 57.—GORDON'S SPLINT.

surface of the forearm, to which is attached a triangular ridge. On the back of the forearm a straight splint is placed, well padded over the wrist. The splints are fixed by straps, and not by bandage.

Carr's splint (fig. 58) consists of an anterior piece, on which the forearm rests. The cross-piece is held in the clenched fingers. A thin back-splint, shaped somewhat like a small paper-knife, is applied to the back of the forearm. **Carr's splint.**

McIntyre's splint.

The Macintyre splint, which is so useful in injuries of the lower part of the thigh and leg, consists of two iron troughs for the thigh and leg respectively, which are hinged together and can be fixed at any angle by means of a screw. There is a foot-piece, which can be worked up and down, making the splint shorter or longer as required, and which can be fixed to the leg-piece at any angle. The splint is

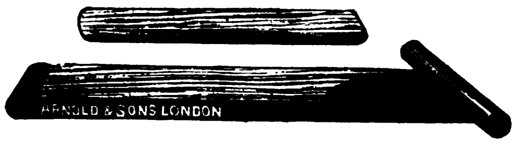


FIG. 58.—CARR'S SPLINT.

adapted to the leg both as regards length and angle, and is well padded. The leg is laid on and fixed with a roller-bandage.

Liston's long splint.

Liston's long splint, reaching from the axilla to beyond the foot, was referred to when speaking of fracture of the femur (see p. 148).

Cline's splint.

The next special splint requiring mention is that known as

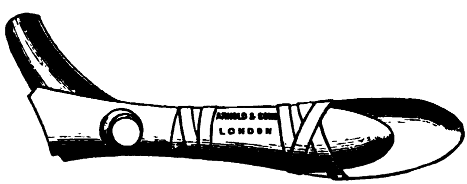


FIG. 59.—CLINE'S SPLINT.

Cline's splint (fig. 59). This pair of splints is used in Pott's fracture, where the lower end of the fibula is broken. The part which has the foot-piece is placed on the outer side of the leg. Many, however, prefer the simpler forms of splint for treating this fracture, and the use of Cline's splint is by no means universal.

The last two special splints to be mentioned are those recommended and invented by Thomas for the hip and knee which bear his name. These splints have proved

invaluable in cases of strumous or tubercular disease of the hip and knee joints.

Thomas's hip-splint. The hip-splint consists of a vertical piece of flat malleable iron, which is shaped to the body, and reaches from the lower end of the scapula to the calf of the corresponding leg in its lower part, as shown in figs. 60 and 61. This vertical

FIG. 60.—THOMAS'S HIP-JOINT SPLINT, APPLIED FROM THE FRONT (CAIRD AND CATHCART).

FIG. 61.—THOMAS'S HIP-JOINT SPLINT, APPLIED FROM BEHIND.

piece has three transverse pieces attached to it, which pass respectively round the chest, the thigh, and the calf of the leg. The splint is made by the blacksmith, and padded either by the saddler or else sometimes by the nurse. It is kept in position by two straps or braces passing over the shoulders. The patient gets about on crutches, the sound limb being raised from the ground by a patten. A great

deal depends on the vertical piece being carefully moulded to the limb. Patients who used to be confined to bed or the house can now get about, and are still able to keep the affected hip-joint at complete rest, which is of such importance in the management of these cases.

Thomas's knee-splint. The knee-splint (fig. 62) consists of a padded iron ring, through which the limb is passed, and which fits into the fold of the groin; and two iron bars, which pass up each side of the leg, and are fixed to this ring above and to an ovoid ring below, which rests on the ground beyond the foot. The splint is kept in position by a strap over the opposite shoulder and by bandages. The thigh and leg rest on a piece of leather between the iron bars. A patten is placed on the boot of the sound limb as before. Hence the joint is kept at complete rest, and is left exposed, the bandage being applied below and above but not over the joint.

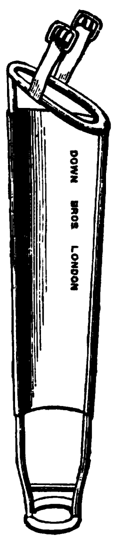


FIG. 62.
THOMAS'S KNEE-SPLINT (RIGHT), FRONT VIEW.

Plaster of Paris. Plaster of Paris forms a most valuable method of applying rest to a part. It is cheap and easily applied, and the nurse must understand the preparing and mixing of the plaster. It is not only used as a splint, but also for making casts. Let us suppose we wish to put up a leg in plaster. **Preparing the bandages.** It is as well to have the bandages prepared beforehand. Gauze or crinoline bandages are thoroughly impregnated with the plaster by working it well into their substance. The limb is bandaged with a flannel roller in the usual way, the webs of the toes being protected by cotton-wool. The plaster should be moderately fine and thoroughly dry. **Mixing the plaster** A little warm water is taken, and the plaster gradually added, being lightly sprinkled into the water. When the plaster begins to rise up through the water, the contents are stirred and worked up till the mixture becomes thick. **Applying the bandages.** In the meantime the bandages have been wrung out of the water as dry as possible, and the limb evenly bandaged to the required extent. **Rubbing in the plaster.** The plaster is now taken, and well rubbed in all round the limb as evenly as possible. Generally a second

layer of bandages is used, sometimes a third, the plaster being rubbed in as before. When the whole is completed, the limb is placed on rests and allowed to dry. As the plaster sets it becomes warm. It should crack off and not crumble when it is dry. The toes are left exposed, and serve as a guide to the condition of the circulation. The plaster of Paris is kept on for a variable time, according to the nature of the case. To remove it the limb may be immersed in water and softened, or a few drops of strong acid poured over it. It is then cut with a knife.

Drying of the plaster.

There are two modifications of the plaster-of-Paris splint: (*a*) the Bavarian, and (*b*) the Croft. The latter of these is more convenient. Both have the advantage of being easily removed.

Modifications of the plaster-of-Paris splint.

(*a*) The Bavarian is made by taking a double layer of strong flannel shaped as in fig. 63 and sewn along the back. The space below corresponds with the heel. The flannel is applied with the seam at the back of the leg. The two inner flaps are brought round the leg and fixed in front. Over their outer surface plaster of Paris is now evenly spread about half an inch thick. The outer layers are then pressed into the plaster, and secured with straps or bandages.

Bavarian splint.

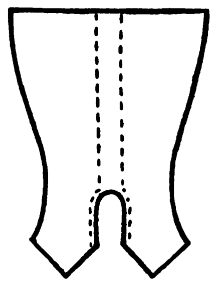


FIG. 63.—SHAPE OF BAVARIAN SPLINT.

(*b*) Croft's splint. This consists of two splints, one for each side of the leg. House-flannel is taken, and a double pattern of each half of the leg and foot cut out, each piece being of the requisite shape to encircle one-half of the limb. One layer is placed in position on the limb, and its outer surface coated with plaster. The outer layer, which has been thoroughly soaked in the plaster, is now placed exactly over the inner layer, the same being done for both sides of the leg. Both layers, being now moulded to the limb, are firmly bandaged. To remove the splint the anterior part of the bandage only is cut: the posterior, which is left intact, serves as a hinge. The value of this splint lies in the fact that it can be removed and reapplied

Croft's splint.

with ease, and, if necessary, the limb can be massaged. Holes may be bored on each side, and the splint laced up in cases where it may have to be worn for a considerable time. If preferred, the inner and outer layers may be fixed in position on a table before being applied to the limb. Where the plaster is apt to become soiled, it is necessary to glaze and render it waterproof by means of size, paraffin, or varnish.

Plaster-of-Paris jackets. Lastly, we must refer to plaster-of-Paris jackets, which are now so commonly used in spinal disease. Poroplastic is, however, preferred by some for the spinal jacket. The patient is partially suspended by means of a tripod and pulleys, so that only the tips of the toes touch the ground. He wears a tight-fitting vest. The plaster-of-Paris bandages, wrung dry out of water, are applied as before, and the plaster, of the consistence of thick cream, rubbed in evenly. A stomach-pad of wool is placed over the region of that organ, or a silk handkerchief or folded towel, before the bandages are wound round. The jacket should reach from the arm-pits almost to the hips. As soon as the plaster has set the stomach-pad may be removed, and the patient carefully laid down before a fire. The best plan is to place a mattress on the floor, and move him periodically from one side to the other, the face being protected from the fire by a small screen. The plaster does not become really hard for quite twenty-four hours as a rule, and it is better to keep the patient in the horizontal position during this time. As soon as the plaster has become dry and thoroughly set it may be sawn down the front and holes made for lacing up, the edges being bound with leather. In cases where a sinus exists a window in the jacket will be required. This must be cut while the jacket is soft.

Crinoline is probably the best material to use for the bandages. Where the disease is high up in the spinal column the cervical region is kept at rest, and supported by an apparatus known as a jury-mast, or some other form of cervical collar.

Jury-mast.

Poroplastic jacket. If it be decided to use a poroplastic jacket instead of the plaster of Paris, the poroplastic must be made to fit accurately, and this generally requires a skilled mechanic. To do this the material is placed in a steam-oven, rendered plastic and fitted on with the patient suspended as before.

But the plaster-jacket is the more easily applied, and, besides being as strong and light as the poroplastic, is cheaper.

Plaster-casting. Plaster-casting can only be very briefly referred to. The following is summarised from Cathcart's description. The stages of the process are three :—

Mixing the plaster. (1) Mixing the plaster. This has been already mentioned. To the mixed plaster some colouring-matter, such as ink or cochineal, must be added, to facilitate the taking of the cast from the mould.

Taking the mould. (2) Taking the mould. As an example we shall take the back of the hand. The hairs are shaved off or smoothed down with vaseline, and the hand is laid, with the fingers and thumb together, prone on a board covered with paper. The hand is smeared with vaseline, and the hollows are filled up. The plaster is laid over the hand to the depth of half an inch. There is a tendency to cover the parts unequally, which must be guarded against. The plaster is now left to set. This is indicated by its becoming warm. It is then carefully lifted from the hand. Where both sides of the hand are to be cast what is known as the "thread plan" must be adopted, and the mould is removed in two pieces. **The thread method.** The plaster is mixed in two lots. One is placed on the board, and the hand allowed to sink a little way into it. The thread or thin twine is made to stick to the skin round the most prominent part of the hand, and the rest of it is covered over as before. The thread is drawn out when the plaster has become of the consistence of cream-cheese, and the mould allowed to set.

Making the cast. (3) To make the cast from the mould the latter is soaked in water for one or two hours before it is required. The pores of the plaster should be so saturated with water that fresh plaster poured into the mould will not stick to it. After saturating it the surface is painted over with olive oil, and the second lot of mixed plaster poured slowly and gently into the hollow of the mould. While this is done the mould is shaken about to prevent air-bubbles forming. The plaster cast which is now made is set aside for about twelve hours, and then the mould is chipped away piecemeal without injuring the cast. The colouring-matter facilitates this being done. A coat of size or of boiled linseed oil may be applied to the cast subsequently.

Trusses. Turning now to some of the commoner surgical appliances, reference must be made to trusses. Of these there are many varieties. The commonest shape is the spring truss, which passes round the body as a spiral. The truss may be single or double, according as the rupture is one- or two-sided. The spring passes round the greater part of the body, a space in front of the abdomen between the two ends being left free and joined simply by a strap.

Varieties of trusses. The nurse should make herself acquainted as opportunity offers with the various trusses; and she will notice that the femoral differs from the inguinal truss in having the pad which is to close the opening more vertical. In some trusses the pads are pyriform, in others circular. To be of any use the truss must be worn constantly while the patient is in the vertical position, and should not be taken off unless he be lying down. It may be necessary to wear it at night.

For bathing a vulcanite truss or one covered with waterproof may be substituted.

In young children a skein of worsted often answers admirably as a truss. It should be twenty-two inches long, and consist of twenty threads. Two such skeins should be in use, to allow of washing. The skein is carried round the body in the usual way, and the end nearest to the hernia is next passed through that which goes round the opposite side. Passing under the thigh, a "figure of eight" is described, and the end is fixed to the turn round the body. The mother should be shown how to apply the "skein truss."

The ordering of trusses. It is useful for the nurse to know how to order a truss. She will not be called upon to take the full particulars (this falls to the surgeon), but she may be required to write for the instrument. The kind of hernia should be stated—inguinal, femoral, or umbilical; age and sex of patient; side on which the hernia is situated, with an idea as to its size. Lastly, the measurements round the body midway between the bony points known as the crest of the ilium and the great trochanter of the femur, the tape going over the seat of the rupture.

Abdominal belts. Abdominal belts are used to give support to the anterior and lateral walls of the abdomen under various conditions, commonly after operations such as ovariotomy. The general shape is somewhat as illustrated in fig. 64, although

there are several variations in details, according to special requirements. In measuring for an abdominal belt the circumference of the body is taken at the points A, B, and C, and the distance between these points vertically.

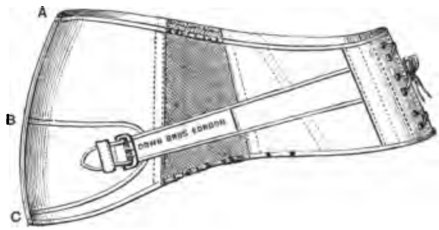


FIG. 64.—DIAGRAM ILLUSTRATING THE ABDOMINAL BELT.

Elastic stockings.

Elastic stockings are a valuable appliance in cases of varicose veins of the leg. They may be made of silk or cotton, and ordered to any length, as shown in fig. 65. For an elastic stocking the usual measurements are those taken at A, B, C, D, and E. The length of the leg

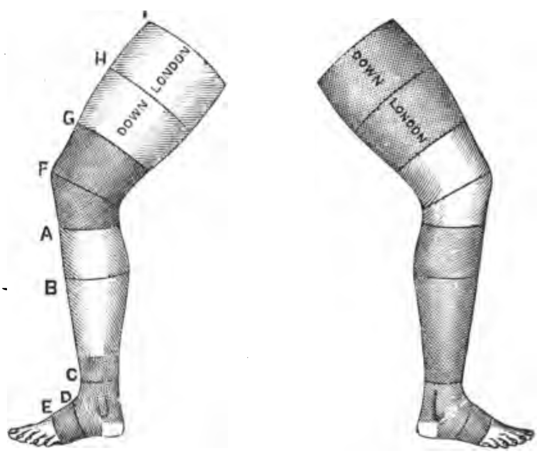


FIG. 65.—MEASUREMENTS FOR ELASTIC STOCKING, KNEE-CAP, AND THIGH-PIECE.

from A to the sole of the foot is also required. Measurements at A, F, and G are required for a knee-cap, and for a stocking for the thigh at G, H, and I. The stocking should

be put on before the patient assumes the erect posture in the morning, and not taken off till the leg is on a level with the body. The stocking is hung over the end of the bed at night to become aired. The measurements given are those recommended by Messrs. Down Bros.

Orthopædic appliances. We can only briefly refer to a few surgical appliances more or less complicated which are in common use in the branch of surgery called orthopædic. This term includes the various forms of club-foot (talipes), knock-knee, bent legs, contracted fingers and toes, and wry-neck. In cases of flat-foot (talipes planus) a common appliance is an india-rubber wedge-shaped pad, which is fixed into the sole of the boot under the lining on the inner side, and acts by forming an artificial arch. They are commonly known as valgus-pads, and are usually supplied by instrument-makers in three sizes. In ordering an outline of the foot on paper should be taken, and an old boot which fits well also sent as a guide. In cases of club-foot before or after operation a boot with one or two side-irons may be ordered, these irons reaching sometimes up to the knee. For knock-knee and bent legs various leather instruments with steel supports are made, in some cases with a band to pass round the pelvis.

Valgus-pads.

Artificial limbs. Of artificial limbs there are many varieties, the amount of movement sometimes to be obtained being very great. The joints of these limbs are made to simulate as far as possible the natural ones which they are to replace. Careful measurements are necessary, the sound limb being used as a guide.

PART III.

CHAPTER XXI.

THE SPECIFIC FEVERS.

THE various fevers we are now about to consider are classed together under the name "specific," because each is produced by a special or specific cause. Scarlet fever, for example, is caused by a particular poison, which produces this disease, and this disease only; and the same applies to the other members of the group. In some cases this poison has been discovered, and has been found to be a germ; in other cases the discovery has yet to be made.

We have already had to refer to fever and many of its symptoms, and to the management of fever cases in general. It will be our object now to describe the more important points in the various fevers, giving an account of each disease, so that the nurse may approach a fever case with an intelligent idea of its nature and course.

Preliminary remarks on fever generally. It will be well to make a few preliminary remarks on fever generally, which will apply in greater or less measure to each disease. The two chief elements in any fever are (1) a rise of temperature and (2) an increased waste of the tissues of the body.

Rise of temperature. The first of these elements is shown by the thermometer; but this alone is insufficient to constitute fever, for we have seen that a rise of temperature may occur apart from fever, as in cerebral hæmorrhage.

Increased waste of the tissues of the body. The second element may be shown by an examination of the expired air and the urine. The carbonic acid gas discharged by the lungs is increased in amount, as are also

the solid constituents of the urine, especially the urea, which is its most important substance, representing as it does the destruction of most of the nitrogenous elements, both of the body and of the food.

Increased consumption of oxygen.

This increased waste of the tissues is partly compensated for by an increased consumption of oxygen. This is a most important point to bear in mind in connection with the management of fever patients, both collectively and individually; for an increased consumption of oxygen demands an increased supply of air. An allowance of fifteen hundred cubic feet of air per bed in an ordinary hospital would, in the case of a fever hospital, need to be increased to at least two thousand cubic feet.

Increased quantity of air required for fever patients.

General symptoms of fever.

The general symptoms of fever vary somewhat, according to the special form which the disease takes. The following symptoms, however, are usually associated with the fever process. These we shall refer to the various systems of the body:—

The digestive system is disordered, as shown by loss of appetite, thirst, a furred tongue, and usually constipation. There is sometimes also vomiting.

The heart beats more rapidly, and there is a corresponding increase in the pulse-rate.

Breathing is usually rapid and shallow.

The skin is hot and dry, but there may occasionally be free perspiration.

The rashes (exanthemata) peculiar to the specific fevers are generally to be found on the various parts of the body, sometimes universally distributed.

We have already referred to the increase of urea and of the other solid constituents of the urine; this causes the urine to become more concentrated, as its quantity is diminished. Occasionally the bladder becomes over-distended, when the urine dribbles away.

Turning to the nervous system, we usually find general malaise, and often headache, shivering (rigors), and sleeplessness; more occasionally convulsions, delirium, and coma.

The muscles not uncommonly waste considerably, especially when the fever is prolonged.

It is customary in describing the specific fevers to speak of five stages, which may be more or less well marked, and may extend over periods varying from a few hours to several weeks.

In the first stage, the period of incubation, the poison which has gained admission to the body is multiplying, but has as yet produced no signs of its presence there. **First stage, or stage of incubation.**

The stage of invasion is marked by the onset of the fever with its special symptoms. It is from the commencement of this stage that the duration of the fever is calculated. **Second stage, or stage of invasion.**

This gradually passes into the third stage, the stage of advance, when the disease is now fully developed. **Third stage, or stage of advance.**

This is followed by the stage of termination or resolution, which may occur suddenly (by crisis) or gradually (by lysis). During this stage relapses are by no means uncommon. **Fourth stage, or stage of resolution.** Lastly, the stage of convalescence is established. **Fifth stage, or stage of convalescence.**

Death, which may occur at any period, is most common during the third stage (stage of advance).

Although there are certain symptoms common to all the specific fevers, most of them are characterised by attacking more especially some special system or organ of the body: for example, typhoid fever selects the bowels, diphtheria the throat and fauces, measles the respiratory organs, dysentery the large intestine, and others the skin.

We shall commence our account of the specific fevers with the disease known as typhoid or enteric fever. **Typhoid or enteric fever.** It is so important that the nurse should be acquainted with this disease, especially with regard to its management, that we shall go more into detail in our description of it than will be necessary in the case of the other fevers. The nurse will find that many points referred to in its management will apply to the management of the other members of the group.

The cause of typhoid fever has been abundantly proved to be a micro-organism, or, to use a popular term, a germ. **Cause.** This germ is in the form of a rod (bacillus), as is the germ which produces consumption (phthisis). The bacillus is introduced into the body in various ways, by water, by milk, or by the air. Water contaminated by sewage has been found to be a fertile cause of outbreaks of typhoid, as was well exemplified in the Maidstone epidemic (autumn 1897). The evacuations from the bowels contain the poison; assisted by stagnation, by warmth, and by absence of fresh air, a sort of fermentation takes place in the stools, which adds intensity to the poison. It must be under-

stood, however, that contaminated water can only cause the disease when it contains the typhoid poison. Probably, in the case of an outbreak traced to milk, water containing the poison has been added to the milk, and multiplication of the germ has rapidly occurred, as the bacillus has been shown to grow well in milk. Cesspools, too, and defective pipes have been proved to be an abundant source of the disease.

Typhoid fever, it must be noted, is rarely transmitted from one person to another, as is the case, for example, with scarlet fever; and where cleanliness is enforced, both with regard to the bed- and body-clothes, and also to the immediate removal and proper disposal of the evacuations from the bowels, infection seldom takes place. Hence many hospitals now admit typhoid cases to the general ward.

Seat of the disease. The chief seat of the disease is the small intestine, in the lower part of the ileum, near the ileo-cæcal valve; and the disease attacks the structures in the wall of the bowel known as Peyer's patches and the solitary glands. These become swollen and thickened, and about a week later ulceration sets in: the surface separates as a slough, which is passed by the bowel, leaving an open ulcer. A blood-vessel may be opened into by the ulceration, with consequent hæmorrhage, more or less severe. Again, the ulcer may extend through the entire wall of the bowel, causing perforation, and escape of the intestinal contents into the abdominal cavity, with resulting peritonitis.

If all goes well, the ulcers begin to heal in the usual way. The nurse should understand that these changes in the bowel occur in crops; and, while one set of ulcers may be healing (third stage), another set rather higher up may have just been developed (second stage), while still higher up in the ileum the process may not yet have gone so far as ulceration (first stage). These three stages—namely, the swelling and thickening of the patches, the ulceration, and the healing of the ulcers—correspond more or less roughly to the first three weeks of the disease. In a mild case the process may stop with the swelling and thickening of the structures mentioned, when no ulceration takes place.

The course of the disease. Turning now to the course of the disease, we find that the period of incubation varies from two to three weeks. It is often, however, hard to ascertain.

Invasion.

The invasion is usually characterised by a sense of general weakness and disinclination for work, sometimes by headache, chilliness, loss of appetite, and perhaps a feeling of disordered stomach and bowels. It cannot be too strongly urged that the disease is very insidious, and, in its early stages, it is often hard to diagnose. The temperature is probably raised, and the pulse quickened. Day by day these symptoms gradually become more accentuated. There is now perhaps a little diarrhœa, and pain and tenderness in the right inguinal region. A characteristic point about the temperature, which is usually present, is a daily rise in the latter part of the day, with a fall in the morning, the temperature rising higher and higher and falling less and less, until the disease is established. This is well shown in the chart, which represents a typical case. The stage of invasion lasts from a week to a week and a half, and is followed by the stage of advance.

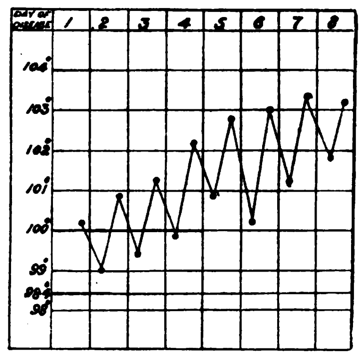


FIG. 66.—TEMPERATURE CHART DURING THE FIRST FEW DAYS OF A CASE OF TYPHOID FEVER.

Stage of advance.

There are four points we shall refer to as being associated with this stage:—

The rash.

(1) The rash generally appears from the seventh to the tenth day. It takes the form of rose-red spots, which disappear on pressure. It is scanty, and is usually confined to the chest and the abdomen. It appears in crops, which fade away in the course of from three to five days. Sometimes a mark is put round these spots with a blue pencil or ink, so as to watch their course, especially when there is any doubt as to the diagnosis.

The abdomen.

(2) The abdomen is swollen and tender. The tenderness is chiefly marked in the right inguinal region, corresponding with the seat of the disease in the ileum.

The bowels.

(3) The bowels are now generally loose, the motions having the well-known "pea-soup" character. The evacua-

tions are very offensive. Occasionally they may contain blood. More rarely the bowels may be constipated.

General condition of the patient. (4) The general condition of the patient. This varies with the severity and the length of the case. Even in a comparatively mild case by the end of the second week the disease will have begun to tell on the patient. He will wear a tired and weary expression, and the eyes will have lost some of their brightness. He will also be restless, sleepless, and inclined to be slightly delirious. The pulse will be weaker than before, and the temperature will remain high. Often the pulse remains comparatively slow, even when the temperature is high; and a rapid pulse generally denotes a severe attack of the disease.

From the end of the second week onwards the course of the disease and its character will vary very considerably. We can here refer only to three types which may be presented—namely, the severe or malignant variety, and the cases complicated either by hæmorrhage or by perforation of the bowel.

The typhoid state. In a severe case the patient suffers from what is known as the typhoid state. The symptoms which characterise this state are, however, by no means peculiar to typhoid, but may occur in other severe diseases, especially where there is great prostration, accompanied by a long-continued high temperature. We shall have to refer to the typhoid state in our description of some other diseases, such as pneumonia and endocarditis. The patient is apathetic, and suffers from delirium and sleeplessness. He lies on his back, and tends to sink down into the bed. There is great muscular weakness, and the pulse is almost or quite imperceptible. He tends to pick at the bed-clothes, and passes his urine and fæces under him. His lips are parched and covered with crusts (sordes), and the tongue is dry and glazed. The abdomen is probably distended, from accumulation of flatus. Breathing is irregular, and the "Cheyne-Stokes" type of respiration may be present. Bed-sores are very apt to form. The typhoid state is by no means always fatal, but always gives rise to anxiety.

Hæmorrhage. Hæmorrhage is generally stated to be most common from the end of the second to the end of the fourth week. It may occur in small quantity and be repeated frequently, or it may be very considerable. The blood may be passed

in clots, or mixed with the motions, which become of a tarry colour and consistence. There are two important signs which, taken together, suggest hæmorrhage: (*a*) a sudden fall of temperature, accompanied by (*b*) an increase in the rapidity and weakness of the pulse. Although such signs do not necessarily imply hæmorrhage, they arouse our suspicions. The nurse may render valuable assistance by a ready appreciation of such symptoms, and thus enable the doctor to act promptly.

Perforation of the bowel.

Perforation of the bowel is a complication which usually occurs late in the disease, being most common in the third, fourth, and fifth weeks. The ulceration, passing through the muscular wall of the bowel, comes to involve the thin peritoneal coat, which may sooner or later give way. The resulting peritonitis may be localised, when the case is more hopeful; but only too often the intestinal contents set up a general peritonitis, and death results. Perforation is accompanied by the symptoms of collapse, an anxious expression, a rapid weak pulse, and increased frequency of respirations. There is generally also severe pain. The abdomen soon becomes swollen, and its walls become characteristically motionless in most cases, instead of moving with the respirations, in spite of the rapid breathing. The patient may die from shock supervening on the perforation before peritonitis has had time to develop.

Stage of termination or resolution.

The next stage of typhoid—namely, the termination or resolution—follows by lysis. The change is a very gradual one. The temperature begins to fall, the diarrhœa ceases, the tongue cleans, sleep returns, and delirium vanishes. Now is the time that relapses are so common, when the symptoms all reappear.

The nurse should associate in her mind the progress of the disease in the bowel with the stages of the fever as she sees them in her patient; so that at any particular period of the malady she can realise in what condition the affected part of the bowel is. This will the better enable her to understand the symptoms presented to her week by week.

Many of the more important points connected with the nursing of severe illnesses such as typhoid have been already discussed in a previous chapter (see chapter vii.), to which the nurse should refer.

Management of typhoid fever.

It will be necessary now to discuss the management of this disease specially. We are presuming that the sick-chamber, the bed, and general arrangements for the comfort and convenience of the patient are, as far as is possible, satisfactory. In private two nurses will be required, one for day and one for night duty.

Disinfection and disposal of the stools.

We have seen that the source of infection lies almost entirely in the stools. The most important point, then, in the prevention (prophylaxis) of typhoid consists in their disinfection and proper disposal. After the bowels have acted the evacuations must be mixed in the bed-pan with a disinfectant, such as carbolic acid or chloride of lime. The disinfectant selected must be added in two strengths: first a weaker (carbolic acid, 1-40) and then a stronger solution (1-20), due time being allowed to elapse between the two stages. Motions must on no account be emptied down the closet until they have been thoroughly mixed with the disinfectant. Some authorities recommend the burning of the evacuations. This is undoubtedly the safest plan, but there are difficulties attending its adoption, and for its satisfactory working the greatest care and attention to details are necessary. The following plan has been recommended by Dr. Armstrong.[1] The bed-pan should first be lined with a piece of paper. On this there is to be placed a layer, about one-third of an inch thick, of peat-moss, which may be obtained carbolised or impregnated with an antiseptic obtained from the pine (such a material is sold as pinol). The amount of peat-moss used will depend on the amount of fluid in the motion, more being added afterwards if necessary. When peat-moss is unavailable, absorbent cotton-wool, or even dry earth or sawdust, may be substituted. The kitchen fire must be kept well made up. A few coals are removed from the top, and the contents of the bed-pan are carefully placed on its hottest part, and the coals replaced. On no account must any of the contents of the bed-pan be spilt. They are lifted by means of the paper or by a piece of old sheeting placed under the paper in the bed-pan. The bed-pan is rubbed out with more peat, and filled with perchloride of mercury solution (1-1000), which is left in it for a couple of hours. Bed- and body-clothes must be put in a tub containing Condy's

Burning of the evacuations.

Dr. Armstrong's plan.

[1] *Brit. Med. Journal*, September 17th, 1897.

fluid (1-50). The water-closets must be well flushed with a solution of "commercial" carbolic acid. The patient should accustom himself from the outset to the use of the bed-pan, as sitting up in bed may be attended with much danger, and will be forbidden by the doctor; indeed, in critical cases, the motions must be caught in napkins, for even the use of the bed-pan may be forbidden. A water-bed or large water-pillow should, if possible, be procured.

Administration of nourishment.

Undoubtedly the most important part of the management of a case of typhoid, as far as the patient is concerned, lies in the administration of nourishment in suitable quantity and quality. The nurse must keep a strict record of the amount of nourishment given, and the times of its administration.

There is now some difference of opinion as to the articles of diet best adapted to this disease. Recognising as we do the nature of typhoid, it would appear only right that such articles should be selected as would produce the least irritation in the bowel, which would be easy of digestion, and would leave little residue as fæces. Most medical men rely on milk and beef-tea as the staple articles of diet, adhering to the rule that no solid food is to be administered until the temperature has been normal for a week. But between this view and that held by a few who believe that any wholesome article of diet may be given in any stage of the disease, provided the patient has a genuine appetite for it, and can therefore enjoy it, is what is very likely the better line to adopt—namely, the middle course. As soon as the more urgent symptoms have passed, such articles as white and yolk of egg, jellies, and even blancmange will be ordered by some doctors, with custards and well-stewed fruit at a later period. These remarks will show that no hard-and-fast lines can be laid down for the diet of a typhoid case; but what must be insisted upon is the most rigid adherence on the part of the nurse to the doctor's orders with regard to the quality of the diet. As to its quantity a well-trained nurse is given a freer hand, and it is left to her own discretion in many cases when to withhold and when to give nourishment. At first two or three pints of milk and about a pint of beef-tea will be as much as the patient can take in the twenty-four hours. These should be given alternately. As a rule it is best not to wake the patient to give him nourish-

ment; but in severe cases, when he is in a condition of apathy and stupor, feeding must be carried out at short intervals. Soda-water, barley-water, or lime-water may often with advantage be added to the milk, and this will tend to prevent its curdling. The whey obtained by curdling milk with rennet is often very grateful and nourishing, and forms a pleasant change. It is especially valuable in cases of irritability of the stomach, when milk is apt to be rejected. When digestion is weak, the milk or beef-tea may be peptonised or pancreatised by the method already described (see chapter viii.).

Inspection of the stools. The stools must from time to time be kept for the doctor's inspection, as it is by an examination of these that the power of digestion is ascertained. In thus keeping the stools it is almost unnecessary to again insist on the utmost cleanliness. They should be placed quite away from the ward or sick-room, and covered with a towel wrung out of carbolic lotion (1-20).

Stimulants. The question of stimulants is, like the diet, one about which there is apt to be a difference of opinion. In a favourable case alcohol is considered by most doctors to be unnecessary; and, again, in the severe or malignant form of the malady, a free use of brandy is always indicated; but there remains the moderately severe type of case in which the question will arise. The strength of the pulse will as a rule form the essential guide. It is of course only in a case of great emergency, when no doctor is at once available, that a nurse should give alcohol on her own responsibility; but such an occasion may arise. In cases of hæmorrhage and perforation alcohol is not generally of primary value; indeed, it is sometimes contra-indicated.

Treatment by drugs. A large number of drugs have been given at one time or another, with a view to influence or cut short the disease; but probably in a simple uncomplicated case no drug is of any great value, and those who withhold them, except with a view to relieve symptoms, such as high temperature, sleeplessness, excessive diarrhœa, pain, and collapse, will obtain the best results. Careful feeding and careful nursing are of far greater importance, and form the keynote to the successful management of the disease.

Reduction of temperature. A persistently high temperature may be a source of danger, and will then require to be reduced. Here cold

sponging, the wet-pack, or a tepid or even cold bath are resorted to. The first mentioned often proves sufficient, but the tepid bath is preferred by some, although the difficulties attending its use are often very great. The bath, to commence with, is about 80° F., but is rapidly cooled down to 70° or even 65° F. To reduce the temperature drugs may also be given either at once or after the above-mentioned measures have failed to give relief. Of these quinine, phenacetin, and perhaps antifebrin may be mentioned as examples.

Intestinal antiseptics. On the supposition that the "poison" of typhoid fever is confined entirely to the intestine, many drugs possessing antiseptic properties have been given, with a view to cut short the disease by destroying the poison; but this line of treatment is by no means universally adopted. Such remedies include carbolic acid, sulphurous acid, perchloride of mercury, salicylate of soda, salol, and allied drugs.

Constipation. The bowels may become constipated in the course of the disease. This is of little consequence, unless it persist for three or four days or longer, when a simple enema of soap-and-water, to which a little glycerine may perhaps be added, will probably be ordered by the doctor.

Diarrhœa. Excessive diarrhœa, when the bowels act more than three times a day, and especially when the patient becomes exhausted, must be controlled. But the diet must first be considered and regulated afresh. If treatment by drugs be necessary, opium by the mouth, or combined with starch as an enema, will usually be employed. Other drugs which are used to check diarrhœa in this disease are the acetate of lead, sulphuric acid, chalk, and iron in one or other of its preparations.

Hæmorrhage. In the management of hæmorrhage the nurse will give small fragments of ice to suck and place an ice-bag over the abdomen. In the meantime the doctor will have been summoned. He will perhaps prescribe one of the drugs just mentioned, together with ergot of rye. The active ingredient of the last named may be injected under the skin. The pulse must be watched during the application of the ice-bag.

Perforation. In cases of perforation opium is our most valuable drug. It relieves the pain and keeps the bowels at rest. In quite recent cases the abdomen may be opened, and the hole

in the bowel looked for and dealt with; but such cases present a very gloomy outlook, and the complication is a very fatal one.

Distension of the abdomen. When the abdomen becomes much distended (tympanites), hot flannel stupes are comforting to the patient, and should be carefully applied by the nurse. If these fail to give relief, an enema of turpentine or one containing a few drops of carbolic acid, with an ounce of castor oil in a pint and a half of barley-water, is resorted to. Great care must be used in giving the enema, no undue force being used in injecting the fluid. Here again opium is often prescribed. Tympanites must always be regarded as a serious symptom.

Among other complications which may arise is pneumonia, which will be treated on the lines laid down for the management of that disease.

Bed-sores. The back must be kept dry, and bed-sores must be prevented. The skin is powdered with zinc and starch, and rubbed with spirit to harden it. It is a good plan to place a good thick pad of absorbent wool under the buttocks. This is comfortable to the patient, relieves pressure, and also acts by absorbing the fæces when the bowels act involuntarily. When bed-sores have formed, they must be carefully dressed with a stimulant and antiseptic lotion or ointment, and pressure removed by using a water-cushion.

The room must be kept absolutely quiet, especially when the patient is apt to be delirious. When coal is to be put on the fire, for example, the nurse must not use any fire-irons, but her hands, protected by an old pair of gloves, kept for the purpose.

Finally, during convalescence the nurse must be especially watchful that no article of diet is taken without the doctor's permission. So extreme is the craving at this time for solid food, when it might be distinctly harmful, that patients occasionally manage to obtain it by stratagem, and for this the nurse must be fully prepared.

Typhus fever. Typhus, or, as it is sometimes called, "gaol fever," is now so rare a disease in this country that it will only be necessary to notice it very briefly. This and the next fever we shall mention are pre-eminently "filth" diseases—that is to say, they occur in epidemics in ill-fed, dirty, and crowded communities, and tend to disappear with the removal of these conditions. The poison of typhus has

not yet been discovered, but we know that the disease is infectious. It is seldom met with among well-fed people who live under healthy or even moderately healthy conditions, herein differing from typhoid, which may attack all classes of society.

The symptoms of the invasion period are not altogether unlike those of typhoid fever. The patient complains of shivering, headache, and languor. The pulse is quickened and the temperature rises, but more rapidly than in typhoid. **Symptoms of invasion.**

About the fifth day a peculiar mulberry-coloured rash, at first a little like that of measles, appears. First seen on the trunk, it spreads to the upper and lower limbs. It tends to be bright at first, and then becomes more dusky. **The rash.**

The termination of this fever is by crisis, and not by lysis, another point of difference between typhus and typhoid fever; the temperature falls suddenly, generally about the fourteenth day. Death not uncommonly takes place at this time; now the temperature rises higher and higher, and the patient passes more completely into the "typhoid state," becoming unconscious (comatose). **Termination.**

The severity of the disease must be fully appreciated. The nervous symptoms are unusually well marked in this fever; hence the necessity for absolute quietness and the use of drugs and other measures to procure rest and sleep. **Treatment.**

A caution about the bladder in this disease. When the patient is lying in a state of stupor, as commonly happens, over-distension is very liable to occur, and must be carefully guarded against, the catheter being used when necessary. The temperature may often require to be reduced in one of the ways we have already seen. Bed-sores are apt to form in this disease, and to spread with alarming rapidity. They must be prevented by all means in our power. When they are spreading quickly, charcoal poultices often answer best. **Caution.**

It must be understood that the patient is to be completely isolated, and the evacuations from the bowels are to be thoroughly disinfected. **Necessity of isolation and disinfection.**

Relapsing or famine fever is an infectious disease of great severity, which is liable to occur in epidemics under conditions somewhat allied to those which generate typhus fever. As its name implies, it is especially associated with **Relapsing or famine fever.**

famines, and is characterised by the liability to the occurrence of relapses.

Scarlet fever, or scarlatina. Scarlet fever, or scarlatina, is a very common disease in this country, especially in children. It is very fatal when it attacks those of three years of age and under. It is most frequently seen in the autumn. It is eminently an infectious disease, and the poison is probably a germ which is readily carried by the air, and given off both by the breath and also from the skin, when "peeling" is taking place. The disease varies much in its severity in different epidemics. Recurrence is rare, so that an attack of the disease may be almost said to cause protection. It should be understood that a mild case or even a "safe" person may transmit a severe attack of scarlet fever. Defective sanitary conditions and over-crowding certainly favour its spread, but rich and poor suffer alike. The patient is infectious during the whole course of the fever, and, as we shall see, infection may continue in some cases for a period of ten weeks.

Incubation period. The period of incubation is variable. It may be only a few hours, or occasionally as long as ten days.

Invasion period: its symptoms. The invasion period is very short, lasting only twenty-four hours. The temperature and pulse are usually characteristic. Probably no fever has so high a temperature and so quick a pulse at such an early period. The temperature may reach 105° F. on the first day, and the pulse may be 160 in a child and 120 in an adult. Other important signs at this stage are sore throat and vomiting, the latter being usually well marked in children, in whom it is not uncommonly accompanied by convulsions. There is a bright red colour over the tonsils and uvula, and sometimes also over the palate. These parts gradually become swollen, and in severe cases (scarlatina maligna) ulceration and sloughing may take place at a later stage.

Sore throat.

Period of advance. The period of advance rapidly supervenes on the stage of invasion, and is ushered in with the appearance of the rash, which gives the name to the disease. It is usually well developed by the second day, appearing first on the chest, abdomen, and thighs, and then spreading to the rest of the body. The skin becomes of a vivid red colour, which readily disappears on pressure. This is well shown by drawing the finger-nail across the skin, when a white

streak is momentarily left. The skin is very hot, dry, and tense. Occasionally the rash is absent or delayed. As a rule it begins to fade about the fifth or sixth day, when peeling commences (sixth or seventh day).

Temperature. The temperature, as shown in the chart, continues to rise to the third or sometimes the fourth day, when it begins to fall, and, in a mild case, reaches the normal during the course of the second week.

Tongue. The tongue is furred, and presents the well-known characters which have given rise to the expression "strawberry tongue."

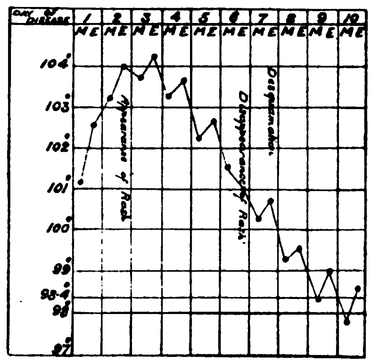


FIG. 67.—TEMPERATURE CHART IN A MILD CASE OF SCARLET FEVER.

Throat. The throat symptoms vary considerably, according to the severity of the attack. The glands of the neck are usually enlarged.

Urine. The urine must be frequently examined, for the kidneys not uncommonly undergo important changes in this disease. The results of these inflammatory changes in the organs sometimes persist long after convalescence, and may even cause death. We shall have to refer to this again when speaking of Bright's disease. Albumin and sometimes blood and casts of the tubules of the kidney are present in the urine. It is during the period of peeling (desquamation) that these changes are especially liable to occur.

Desquamation, or peeling. We have said that desquamation commences with the disappearance of the rash. The skin becomes scurfy and separates in flakes. The process generally commences on the neck and chest, the hands and feet being the last parts to be affected. The nurse must understand that this is the most infectious period of the disease, because the particles are full of the poison and are easily disseminated when they become detached. Desquamation may be very slight or well marked, occupying a longer or shorter time,

often eight weeks or even longer. In some cases it is only during the period of peeling that the disease is discovered, there having been no symptoms to suggest its presence. To such cases the term scarlatina latens (hidden scarlatina) is applied.

Scarlatina latens.

One other point about desquamation. Not only must the period be regarded as a highly infectious one, but also as a critical time; for now many complications may arise, not only kidney disease and consequent dropsy, but rheumatism, inflammation of the heart (pericarditis and endocarditis), disease of the ear, and swelling and suppuration of the glands of the neck. All these complications may leave after-effects, which are more or less permanent, and may in some cases even cause death.

Management of scarlet fever.

The management of this disease comprises the steps to be taken both in the interests of the patient and of the community in general. It is with the latter that we shall deal in the first place. It is almost needless to say that immediately a case of scarlet fever occurs every precaution is taken by the doctor to limit the spread of the disease. The patient is either at once moved to a fever hospital, or, if this is not feasible, the case is isolated and treated at home. If no other case occurs in the house during the first week of the disease, provided always that there has been no further source of infection, the inmates may be regarded as safe and not likely to spread the disease. If the case be moved to the hospital, the room occupied should be locked up till the proper disinfection has been carried out by the sanitary authorities; and not only the room occupied, but all articles exposed to the infection, must be thoroughly disinfected. The nurse must understand how easily the disease may be spread by infection clinging to curtains, wall-paper, beds and bedding, carpets, clothes, papers, books, letters, and the like, by which the disease may be lighted up long after the orginal infection.

Disinfection.

Heat.

This leads us to consider the subject of disinfection. There is no doubt that the best disinfectant we possess is heat, either dry, or moist, as steam. But this method is by no means universally applicable. The temperature of dry heat should not be below 220° F. Moist heat should have a temperature of 212° F. (boiling-point). Heat acts by killing the germs and their products (spores).

Next to heat we must place chemicals as a means of disinfection, and of these the most reliable is perchloride of mercury (corrosive sublimate); but its poisonous properties must be kept in mind; and, in order to distinguish it from water or other colourless liquid, some colouring-matter, such an aniline or cochineal, is not uncommonly added to it. The solution to be used varies from 1-1000 for excreta to 1-2000 for clothes and utensils generally, and 1-5000 for personal use. Carbolic acid should not be weaker than 1-20 to give good results. In using crude carbolic one gallon should be added to sixteen gallons of water. Substances somewhat allied to carbolic are Jey's fluid and izal, which, if used in sufficiently strong solution, may be recommended. Condy's fluid is used as a deodorant rather than as a disinfectant, since in order to be of any use as the latter the quantity required would be enormous. A basin of water containing some Condy's fluid will tend to absorb foul gases, which will cause the pink colour to become brown.

Disinfection by chemicals. Perchloride of mercury.

Carbolic acid.

Condy's fluid.

The third method of disinfection is by fumigation, where we again make use of chemicals, which act by the vapour which they give off. Fumigation is a favourite and convenient method of disinfecting rooms and other closed spaces. Two of the commonest substances used are flowers of sulphur and bleaching-powder, which give off sulphurous acid and chlorine gas respectively. One pound of sulphur should be allowed for every thousand cubic feet of space, and, in the case of bleaching-powder, one pound for every five thousand cubic feet. For example, a room twenty feet long, twelve feet wide, and ten feet high would contain two thousand four hundred cubic feet ($20 \times 12 \times 10$); such an apartment would require almost two pounds and a half of sulphur, and almost half a pound of bleaching-powder. The room is rendered as nearly air-tight as possible by covering up the window-sashes, ventilators, doors, and fireplace. This is best done by pasting stiff brown paper over these apertures. It is advisable to steam the room well before beginning to fumigate. The sulphur is placed in an iron vessel in the centre of the room, which rests on a bucket turned upside-down. After igniting it, the room is closed and left for twenty-four hours, when a strong current of air is passed through the room to remove the fumes.

Fumigation.

Finally, in the event of death occurring in a case of infectious disease, the body should be covered with a sheet wrung out of carbolic (1-20) or perchloride of mercury (1-1000).

The sick-room. The sick-room should answer the requirements already laid down. A minimum of furniture should be retained. All curtains and carpets must be removed, and the floor kept well scrubbed with carbolic soap. A sheet damped and kept wet with carbolic acid lotion is suspended outside the door. In the room there must be at hand two solutions, one of Condy's fluid to dip the hands and utensils in, and one of carbolic or perchloride of mercury, in the strengths indicated for other requirements. The nurse and all who come in contact with the patient must wash their hands with carbolic soap and change their dress as soon as they leave the sick-room. At least six weeks must elapse before the patient be freed from isolation; often a longer period is necessary before he can be pronounced free from infection.

Management of the patient. Turning to the management of the patient, we must understand that there is no course of treatment which will arrest the disease, and drugs are only necessary to relieve symptoms and to combat any complications or after-effects of the disease. The temperature will be controlled either by local measures, such as tepid or cold sponging, the warm bath or cold pack; or by drugs, such as quinine; or perhaps a combination of both. The throat symptoms will be relieved by a gargle, the sucking of small pieces of ice, or, in children, the sipping of iced water. The application of heat, dry or moist, is also of value. In cases of pain and stiffness in the neighbourhood of the ears the neck is sometimes poulticed. The skin should be well rubbed almost from the commencement of the disease with carbolic or camphorated oil, in order to limit as far as possible the diffusion of the desquamating particles. This also relieves the burning and tension of the skin which is complained of early in the disease.

Diet. In the first few days the diet will consist of milk, broth, and perhaps eggs, with cooling drinks. In a mild case, as soon as the more acute symptoms have subsided and the temperature has begun to regain its normal level, other articles of food will be allowed; but in cases which are complicated by kidney mischief, even in slight degree, as

evidenced by the presence of albumin and perhaps also tube-casts in the urine, nitrogenous food will be withheld. Alcohol is only required in severe cases, more especially in very young children who show signs of collapse. The condition of the pulse will, as usual, be the doctor's chief guide in this respect.

Measles. Measles is a very common and easily spread disease. The most infectious period is the stage of invasion, when the chief symptoms are those of a severe cold in the head, for which it is often mistaken. The disease seldom affects the grown-up.

Incubation period. The incubation period is longer than that of scarlet fever, generally from a week and a half to two weeks.

Invasion period. The invasion period lasts about four days. During this time there is a rise of temperature. Headache and chilliness are complained of. There is running of the eyes and nose, sneezing, occasionally bleeding from the nose, and even convulsions in the young. Sore throat and a troublesome cough are also usually present. These symptoms gradually increase in severity until the appearance of the rash on the fourth day, when the temperature has often risen to 104° F., or even higher.

Stage of advance. The stage of advance, which has now commenced, lasts about five days, the temperature meanwhile having commenced to fall. It reaches the normal by the seventh to the ninth day, unless complications such as bronchitis and pneumonia arise.

Rash. The rash first appears on the face, and consists of little elevated red spots, which disappear momentarily on pressure. These spots tend often to arrange themselves into crescents. Spreading from the face to the trunk, and, to a less extent, to the limbs, the rash lasts about three days, and is followed by peeling, generally about the ninth day. The scales are not so large and by no means so infectious as is the case in scarlet fever. **Peeling.**

The mortality arising from measles, when the disease occurs in an epidemic form, is often considerable, especially among the young. This is generally due to lung disease supervening as a result of exposure during the period of advance. Hence the importance of not looking lightly on an attack of measles, but in insisting on confinement to one room as soon as the initial symptoms appear. In **Management.**

an ordinary uncomplicated case little is required in the way of remedies, even less than in scarlet fever. A well-ventilated sick-room kept at an equable temperature, plenty of fluid nourishment, and cooling drinks are the chief points in the management. Rest in bed, even in a mild case, is advisable for at least two days, generally longer. A mixture is often prescribed containing drugs which promote the action of the skin, and which soothe and check the cough. It may be necessary to resort to measures to reduce the temperature, but this is exceptional.

As time goes on the ordinary diet will be gradually returned to. In debilitated and weakly children a stimulant may be required during convalescence (port wine). Where collapse or chest complications threaten a stimulating line of treatment is necessary, and it may be necessary to administer brandy freely.

The precautions referred to under scarlet fever to limit the spread of the disease must of course be insisted on equally in this disease.

German measles. The disease known as German measles, or epidemic roseola, of which the nurse has probably heard, requires brief mention. It is quite distinct from measles, and the symptoms are not so well defined, nor are they so severe. Its management is very similar to that of measles, but the restrictions need not usually be quite so strictly enforced.

Mumps. Mumps is an acute infectious disease which manifests itself chiefly as a swelling of the salivary (parotid) glands and their surroundings. The patient feels out of sorts, chilly, and perhaps sick. This is followed by a rise of temperature, pain, and swelling in the regions mentioned, which give rise to difficulty in opening the mouth and swallowing. Recovery occurs in a few days.

Management. Hot fomentations may be applied locally, either of plain hot water or combined with such soothing agents as laudanum, poppy-heads, or chamomile flowers. The diet should be light; it will generally be necessary to give slops until the swelling has subsided. Confinement to one room for a couple of days is generally advisable. Poultices will be ordered if suppuration threaten; and if an abscess form, as not uncommonly happens, it will be opened in the usual way.

Small-pox. Small-pox, or variola, is now fortunately a much rarer

disease than it used to be, thanks to the work of Jenner, the discoverer of vaccination. Not only this, but repeated observation goes to prove beyond doubt the influence of vaccination on the course of the malady, inasmuch as a dangerous and often fatal disease becomes transformed into a comparatively mild disorder, according to the time which has elapsed since the patient was vaccinated. Small-pox is caused by a poison, the nature of which we are not yet acquainted with. It is very commonly spread by tramps and vagrants, although by no means entirely so. In unvaccinated communities it spreads with alarming rapidity, carrying off large numbers.

Incubation period.

The period of incubation lasts from a week and a half to a fortnight. The characteristic symptoms which usher in the disease are attacks of shivering, pain in the back, headache, vomiting, and marked elevation of the temperature.

Invasion period.

The invasion period lasts from two to three days, and is followed by the stage of advance, when the rash appears.

Stage of advance.

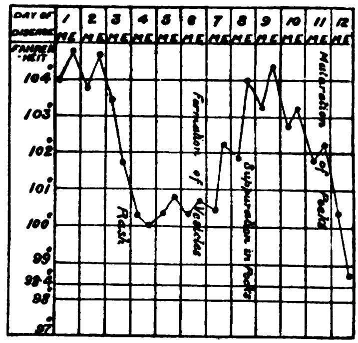


FIG. 68.
CHART OF A CASE OF SMALL-POX.

Rash.

Let us briefly trace the course of the rash. It first appears on the face, taking the form of little pimples, and the skin feels as if little particles of shot were embedded in it. These little pimples (papules) gradually spread to the rest of the body. Meanwhile the temperature falls. In about three days the pimples come to contain a watery fluid, when they are known as vesicles. About the eighth day of the disease the watery contents of the vesicles become purulent, when pustules are developed. Inflammation takes place round the pustules, and this continues till the eleventh day, when the process subsides and maturation is said to have occurred. Now, the temperature, which had gone up with the pustular change, drops again. This second rise of temperature is very characteristic in small-

Secondary fever.

Maturation.

pox, and marks the period of "secondary fever." The pustules begin to dry up, and form scales or scabs, which gradually separate, and are thrown off. Our description applies to a mild case.

Various types of small-pox. The disease may present all degrees of severity, and may be complicated or followed by various affections, among which may be mentioned pneumonia and pleurisy. Death in severe cases most commonly occurs during the period of secondary fever. In some cases the pimples, instead of being separate (discrete), may be massed together, so that the whole skin becomes swollen and disfigured; this is more apt to occur a little later in the disease, when the contents of the vesicles and pustules run together, this condition being known as "confluent" small-pox. Again, severe nervous symptoms are not uncommonly present, such as we have seen to constitute the "typhoid state."

An attack of small-pox nearly always confers protection. The "pitting" occurs as a result of the destruction of the true skin. When only the epidermis, or scarf-skin, is involved, no pitting results.

Vaccination. A few words, in connection with our description of small-pox, on vaccination will not be out of place. Vaccination may be defined as the introduction into the blood of the material (lymph) obtained from the disease known as vaccinia, or cow-pox, which is in all probability small-pox occurring in the cow. This material has been found to protect from small-pox for a varying period of time, and to mitigate the disease, when contracted, in the way already mentioned. We must believe that the small-pox poison is so modified in the cow as to be deprived of its power to produce severe and fatal symptoms in the human being. It is unnecessary to describe the technique of vaccination, save to mention that calf lymph or human lymph is nearly always used.[1]

Vaccination should always be performed early in life, and again, if possible, in early adult life. In the event of an outbreak of small-pox occurring in a community, it is necessary for the attendants and for those exposed to the infection to be revaccinated. The following figures may be quoted as showing the benefits conferred by vaccination :—

[1] Calf lymph which is mixed with glycerine is now supplied to public vaccinators by the Local Government Board.

Statistics of Small-pox Hospital.

Mortality of those previously vaccinated	6·5 per cent.
Mortality of those with good vaccination marks	2·5 per cent.
Mortality of those unvaccinated	37 per cent.

It will be seen, then, that the result of a case of small-pox depends very largely on whether the patient has been vaccinated or no.

Management of small-pox. As is the case in most of the specific fevers, we have no cure for small-pox and its complications, and the management of the disease, both as regards the patient and the protection of the public, must be carried out on the lines already laid down. The nurse must bear in mind the severity of the disease in its more serious forms, and must leave nothing undone for the patient's comfort. Rest, fresh air, cleanliness of the person and bed-clothes, are most important. In this disease the skin requires special attention. The irritation is sometimes intolerable, and requires to be allayed by the free use of some emollient, such as cold cream or vaseline. Various measures have been adopted to try and prevent pitting, but they are of doubtful value. In confluent cases carbolised oil may be used freely with this object. The mouth and tongue must be kept clean and moist. The disagreeable odour so often exhaled by the skin must be counteracted by deodorants, such as sanitas powder. There may be violent delirium; here constant attention is required, and no undue force or restraint must be used.

Chicken-pox. About chicken-pox (varicella) little need be said. It is a mild disease of about a fortnight's duration, characterised by a rash which appears on the second day. At first consisting of pimples, the rash quickly becomes vesicular. These vesicles dry up into crusts, and drop off, leaving little or no scar. Chicken-pox has to be distinguished from small-pox occurring in a vaccinated person (modified small-pox). In the former disease the fever is slight, and does not precede the appearance of the rash, as is the case in small-pox. Probably the disease is never fatal, and no special treatment is required.

Diphtheria. We now turn to an important disease—namely, diphtheria. This the nurse will probably not uncommonly encounter, and its management requires special experience. Diphtheria may be regarded as an acute disease of the throat and larynx, sometimes also of the trachea and bronchi and other parts, which produces formidable effects throughout the system.

Cause of diphtheria. We now know that diphtheria is caused by a germ—a bacillus—which is responsible for the local manifestation of the disease in the throat and larynx. This bacillus also produces a poison, which causes the general symptoms of the disease. There is no doubt that the disease is an infectious one, as it often occurs in epidemics. It is, however, by no means clear how the infection is always spread. The bacillus can generally be found in the membranes which, as we shall see, are formed in the throat and larynx, and thus it is easy to see how direct infection may arise by kissing or by contamination with the material brought up in the act of coughing. But this only accounts for quite a few cases of the disease. Outbreaks have been traced to milk and bad sanitary arrangements. Probably the latter cause operates by causing a sore throat, which thus favours the lodgment and growth of the bacillus there. Diphtheria is especially prone to attack children between the ages of three and twelve.

Incubation period. The incubation period is not easy to ascertain, as the symptoms of invasion are apt to come on very insidiously. It may be said to vary from a few hours in some cases

Invasion. of direct infection to a week or more. The first symptoms of the disease are ill defined. The patient feels chilly and disinclined for any exertion. His appetite may be impaired, and he may feel sick. The temperature at this stage is not usually markedly raised. The throat symptoms now soon show themselves, and with their onset the fever becomes

Appearance of the throat. more marked and the pulse quickened. On looking at the throat a general diffused redness is visible, affecting the tonsils, the soft palate, and the pharynx, behind the uvula. A sticky secretion is soon poured out, and a greyish membrane then appears. Suppose a small piece of this membrane were now detached, as is commonly done to ascertain the presence in it, by examination, of the diphtheria bacillus, a raw excoriated surface would be left. The mem-

brane gradually becomes more firmly attached, and may now either cease to spread further, or may extend into the back of the nose or into the larynx, and, less commonly, into the trachea and bronchi. The severity of the symptoms depends considerably on the involvement of the larynx and air-tubes in the disease. In addition to the membrane there is generally present a swelling under the jaw on each side, due to enlargement of the glands.

The general symptoms vary very considerably, as do those referable to the throat. **General symptoms.**

We may briefly refer to a few types of the disease, as showing the varieties which the nurse may encounter. **Types of the disease.**

(1) The mild case, which attracts little attention, and is apt to be overlooked. **Mild case.**

(2) The case complicated by involvement of the larynx, when the voice becomes husky, the breathing much embarrassed, and the patient may quickly die from suffocation. In such cases a sucking in of the lower parts of the chest will be observed with each inspiration. **Case complicated by involvement of the larynx.**

(3) The case which is characterised by great exhaustion and depression, with weak pulse and imminent heart failure. In such a case the patient is apt to pass into the "typhoid state." **Case complicated by great exhaustion and imminent heart failure.**

(4) The case in which the disease is followed by various forms of paralysis: (*a*) of the soft palate, causing inability to swallow liquids, which return through the nose; (*b*) of the eye, causing squint, and sometimes inability to fix the eye on near objects, as is required, for example, in reading; (*c*) of the limbs, which is seldom complete, and rarely lasts longer than two or three months. All these forms of paralysis present a good prospect of recovery. **Case followed by various paralyses.**

In an ordinary case of diphtheria the temperature seldom rises higher than 103° F.

The urine often contains albumin, and is frequently examined on this account. In this disease the albumin occurs during the acute stage of the malady, and not during convalescence, as is the case in scarlet fever. **Urine.**

The termination occurs by lysis, not by crisis. While the false membrane breaks down, separates, and disappears, the strength is gradually regained. **Termination.**

The average duration of a moderately severe attack may be stated to be a fortnight. **Duration.**

Death. Death may occur from (*a*) great exhaustion, (*b*) heart failure, and (*c*) suffocation.

Diagnosis. The question of diagnosis may cause much difficulty to the doctor. It is now generally the custom to remove a portion of the false membrane, and to submit it to examination, microscopically and otherwise, to detect the presence of the bacillus. Inflammation of the tonsils and scarlet fever may simulate the disease in its early stages.

Management of the disease. We shall consider the special management of diphtheria under the following heads: (*a*) prevention, (*b*) local symptoms, (*c*) general symptoms, (*d*) diet, and (*e*) what is known as the antitoxin treatment.

Prevention. (*a*) Prevention. The patient must, of course, be completely isolated; and those who come in contact with him must protect themselves by gargling with Condy's fluid or glycerine and carbolic. This should be done repeatedly after attendance on the patient. The nurse must remember that the infection is carried in the false membrane and in the patient's exhalations. All discharges should be put into boiling water, as this is best calculated to kill the bacilli. The patient must expectorate into carbolic or perchloride lotion (1-20 and 1-1000 respectively). He must be kept isolated for fully a week after all the symptoms have disappeared.

A word about the conferring of protection from diphtheria. This has been done in the lower animals. By taking the serum (fluid part) of the blood from the body of an animal which has had diphtheria, and introducing it into other animals, they have been protected, as shown by the failure of such animals to contract the disease under circumstances which would undoubtedly have produced it had they not been so treated. This corresponds somewhat to vaccination as a protection against small-pox. Perhaps vaccination against diphtheria may in course of time come to be an established procedure, at any rate in cases where the disease is prevailing as an epidemic.

Local symptoms. (*b*) Local symptoms. It is in the management of these symptoms that so much watchfulness and care are called for on the part of the nurse. It must not be forgotten that an apparently mild case may, with little or no warning, develop the most alarming symptoms, arising from the extension of the membrane into the air-passages; and the

disease must always be regarded as eminently treacherous. Under ordinary circumstances the management of the throat consists in trying to arrest the formation of the false membrane and to relieve the discomfort. Various remedies may be applied to the throat, either with a brush, or in the form of gargle, powder, or spray. It is often a good plan to use two or more of these methods alternately. The utmost gentleness must be used in making the applications, which will often require to be used frequently, even every quarter of an hour in bad cases; nor must the remedies be in the least degree irritating in character. As examples of such remedies may be mentioned boro-glyceride, perchloride of iron and glycerine, carbolic acid (1-40), chlorate of potash, and Condy's fluid. The room must be kept warm and well ventilated. In cases where there is any difficulty in breathing the air must be rendered moist by means of a bronchitis-kettle and a "tent fixed" over the bed. Hot fomentations, which must not be heavy, may be applied round the throat. It is especially in children that embarrassed breathing is so liable to occur, from the involvement of the larynx by the membrane. The nurse will be warned of this complication by a troublesome harsh cough, a whistling type of breathing, increase in the frequency of the respirations, and perhaps loss of voice. The child often clutches at the throat as the embarrassment increases. "Sucking in" of the ribs, as already mentioned, will occur, the child will become blue, and death from suffocation may rapidly ensue, unless relief be given. As soon as her suspicions are aroused the nurse will promptly summon medical aid, while hasty preparations will be made for tracheotomy or perhaps laryngotomy (see chapter xix.). The operation known as "intubation" of the larynx, in which a metal tube is passed into the larynx, is now often undertaken in these cases instead of tracheotomy.

General symptoms.

(*c*) General symptoms. The most important point to be kept in mind in this connection is the depressing action of the disease on the heart. A stimulating line of treatment is usually adopted for this reason. In cases marked by debility the patient must be saved every possible exertion. In all severe cases alcohol will be necessary, often in large quantities. Brandy is most suitable, but where a rapid

action is required champagne is often to be preferred. Drugs, such as digitalis, perchloride of iron, and strychnine, are often prescribed to strengthen the heart; but it must be understood that we can only treat the symptoms as they arise, and place the patient in as favourable a position as possible to fight against the disease. In cases followed by paralysis, strychnine, injected hypodermically, is our most valuable remedy, combined with the battery (interrupted or "faradic" current), massage (when the limbs are affected), and fresh air.

Diet. (*d*) Diet. There are often serious difficulties to contend with in connection with the diet in this disease, for a complete loss of appetite is not uncommonly associated with inability to swallow in greater or less degree. Again, vomiting is often a troublesome symptom, and may be easily set up by the administration of too large a quantity of nourishment at a time. Therefore "little and often" will probably be the doctor's directions. Milk will be chiefly depended on; it may be mixed with soda-water or lime-water, or iced in hot weather. The yolk of an egg may be beaten up in it. Strong beef-tea and chicken-broth are generally allowed, and in cases where they are rejected the patient will often be able to take them in the form of a jelly. Many of the meat-extract and meat-juice preparations on the market may be used with advantage. In certain cases, especially in children, where food is refused, rectal nourishment by nutrient enemata or suppositories must be resorted to. Nasal feeding is both troublesome and disagreeable, and is probably never called for. We have already referred to the use of alcohol in one form or another in severe cases. But, apart from this, it is often prescribed during convalescence, as port-wine or Burgundy or in other form, in quantities suitable to the age of the patient.

Antitoxin treatment. (*e*) Antitoxin treatment. Lastly, a few remarks must be made on the treatment of the disease with the remedy known as diphtheria antitoxin, by which is meant an agent that is able to counteract the poison we have seen to be evolved by the diphtheria bacillus, to which the general symptoms of the disease are due.

Source of the antitoxin. Let us first enquire how the antitoxin is obtained. The bacillus is grown under favourable circumstances in a

flask containing some suitable substance, such as broth, in which it is able to multiply. In due course the poison, or "toxin," is produced. This toxin is so strong that a small dose of it injected into a guinea-pig causes death in forty-eight hours. The toxin thus obtained is injected into an animal, such as the horse, in doses, at first small, but of gradually increasing strength, until a dose is borne without any symptoms, which, given to a similar animal in the first instance, would rapidly cause death. The horse is gradually "acclimatised" to the poison, and becomes protected from the disease in about three or four months' time. The next step is to secure some of the blood of the protected horse. This is collected and allowed to coagulate, and the "serum" is utilised. This serum constitutes the antitoxin (Gk. *anti*, against; *toxin*, poison). After the serum has been tested and its "protecting power" ascertained it is ready for use, and is sealed up in bottles and dispatched accordingly. These details have been entered into because, as the nurse will perceive, this process may be applicable, and is gradually becoming increasingly so, to the treatment of other diseases caused by germs and their poisons (toxins), such as tetanus (lock-jaw). Briefly, then, the steps in the preparation of antitoxin are: (1) the obtaining of the toxin from the germ, (2) its introduction into one of the lower animals in doses of gradually increasing strength until the animal is protected, (3) the obtaining of the blood of this animal, and (4) the testing and preparing for use of the serum derived from the blood.

This method of treating diphtheria has now been in the hands of the profession sufficiently long to prove its undoubted value, and the number of cases of bad diphtheria which have recovered under this treatment—in fact, the number of lives which have been saved—is sufficient to give to this remedy the first place in the means at our disposal for the treatment of this disease. A well-known authority on diphtheria, indeed, gives it as his opinion that antitoxic serum ought to be injected in every case, and as early as possible. It is of no use, he says, waiting for serious symptoms and then injecting it. We cannot foretell the course of a case of diphtheria, because, as we have already said, the disease is so treacherous. All that can be urged against the use of the serum, when injected

with proper precautions, are a few symptoms which are apt to follow, such as a rash and pains in the joints. But these symptoms are of relative unimportance, and subside under appropriate treatment. The serum acts beneficially by relieving all the symptoms; in fact, the disease is rendered mild in proportion to the time the poison has been developing in the system, and therefore the time required by the serum to counteract that poison. The serum is injected deeply under the skin with a syringe specially devised for the purpose with strict antiseptic precautions. The favourite sites chosen are the region of the shoulder-blade and the flank.

Croup. It will be convenient to mention here the disease known as croup. The relation of this disease to diphtheria is not yet agreed upon, some considering croup to be a laryngeal diphtheria, while others look upon the two diseases as distinct. Probably the latter view is the one most generally held. However, those who so consider the disease often have much difficulty in deciding with which affection they have to deal. True croup is characterised by the formation of a "false membrane"; but instead of primarily involving the throat, it is the larynx and trachea which are more especially affected. It is a children's disease, occurring generally between the ages of two and eight years.

Cause. Croup may arise in the course of an attack of measles or scarlet fever, but the commonest cause is exposure to cold and wet.

Symptoms. It commences as a cold. There is slight fever, hoarseness, and a dry barking kind of cough, which is very characteristic. These symptoms become aggravated, and suddenly, generally at night, the breathing perhaps becomes obstructed. The child sits up in bed and clutches at his throat. The breathing is noisy and laboured, and the entrance of air into the chest is accompanied by "crowing." There is generally an anxious expression of face, and the voice is lost. These symptoms may soon subside, sometimes to rapidly reappear, or may become so alarming as to require immediate tracheotomy to save life.

False croup. A form of croup may be met with (false or spurious croup) presenting all these phenomena, but without the formation of any membrane.

Management of croup.

The management of croup is very much that of laryngeal diphtheria. A warm room, a tent, and a kettle are of course necessary. Emetic drugs, such as ipecacuanha, are valuable remedies, as are also other drugs, such as belladonna and the bromides of ammonia and potash, to relieve the spasms. Locally, the application of heat is most soothing, as fomentations, poultices, or hot sponges round the throat. The strength must be supported by alcohol and by strong beef-tea. The brandy-and-egg mixture, in suitable quantities according to age and other conditions, is often prescribed.

The nurse must have every preparation made for tracheotomy or intubation of the larynx in cases where there is the slightest suspicion of laboured and obstructed breathing.

We are probably correct in believing that croup is not an infectious disease, but at the same time the nurse should adopt the precautions mentioned in speaking of diphtheria in dealing with the membrane which is coughed up, and must avoid the risk of the child spitting in her face.

Whooping-cough.

Whooping-cough (pertussis) is an infectious disease of the air-passages, which is very possibly caused by a germ. No such cause has, however, yet been discovered. The characteristic symptom of this disease is the peculiar type of cough, from which the name of the malady is derived. After a varying period of time, during which there are slight feverishness and signs of a cold, the second stage of the disease is entered upon, which is marked by the typical cough. This may be described as a long-drawn crow or whoop, which, when once heard, is seldom forgotten. During this period there is often embarrassment of the breathing. The whoop generally ends with the spitting up of a little sticky mucus, or with an attack of vomiting. The temperature is not as a rule raised. The disease, although sometimes alarming and of long duration, is rarely fatal, except in weakly children. One attack usually affords protection.

Management.

The infectious nature of the disease must not be lost sight of. Infection is conveyed by the air and also by the sputum. Therefore all handkerchiefs and soiled linen must be either burnt or thoroughly disinfected. The child, if old enough, must be directed to spit into a sputum-pot

containing an antiseptic, as already described. He should be kept quiet and free from draughts and all excitement, as these tend to bring on the cough. The chest may be rubbed with camphorated oil or some stimulating liniment. Sometimes, in the early stages, poulticing is of value. A simple and nourishing diet is necessary; seldom is alcohol required. Drugs are given for the purpose of relieving the cough and spasm, and to promote the discharge of the sputum. In the later stage of the disease tonics and a change of air are ordered to complete convalescence.

Cholera. Cholera is a disease which only occurs in this country at certain periods, when infection is carried by ships coming from places where the disease is prevalent. Our admirable port sanitary arrangements have on several occasions prevented an epidemic of cholera which would otherwise have inevitably occurred. True or, as it is termed, Asiatic cholera, as distinguished from English cholera, which is a quite distinct and altogether less formidable malady, is caused by a germ discovered by Koch (the discoverer of the bacillus of tuberculosis), and known as Koch's "comma" bacillus, on account of its shape. This bacillus produces a poison, which acts on certain parts of the body, whereby the phenomena of the disease are developed.

Symptoms. The symptoms appear and progress with alarming rapidity. The patient at first complains of a feeling of discomfort in the region of the heart, and this is accompanied by a copious watery diarrhœa, the stools soon coming to have the well-known "rice-water" appearance. There are severe cramp-like pains, and also vomiting. Collapse soon follows, the pulse becomes feeble, the skin clammy and cold, the temperature often falling to 90° F. or lower. The tissues now become shrunken, due to the loss of fluid by the bowel. Urine is no longer secreted. Death may occur rapidly, or a period of reaction may supervene, all the symptoms gradually subsiding, leaving the patient prostrate. There is often, however, a relapse.

As far as our own country is concerned the disease can generally be controlled by strict quarantine when it has been imported, and by the adoption of the usual precautions for the prevention of the spread of infectious diseases.

Management. The severe purging must be checked as far as possible, and the strength supported. As far as the nurse is concerned

the most stringent cleanliness must be observed in dealing with the evacuations, which must be promptly and thoroughly disinfected.

The diagnosis of true cholera requires to be confirmed by the examination of the stools for the cholera bacillus. **Diagnosis.**

English cholera, which signifies a severe watery diarrhœa, accompanied often by vomiting and collapse, will be referred to again when we come to speak of diarrhœa (chapter xxii.). It may be impossible sometimes to distinguish this disease from true cholera until the stools have been examined for the bacillus. English cholera is not infectious, and the bacillus is absent. **English cholera.**

The name malaria, or malarial fever, is applied to a disease which occurs in low-lying and damp localities, occasionally in this country, but more especially and more severely in special regions, such as parts of India and Africa. The disease is due to the malarial poison, which has lately been discovered to be a germ, present in the red blood-corpuscles. The disease is characterised by a certain set of symptoms, which either appear and disappear at regular intervals (intermittent fever or ague), or else, without entirely disappearing, abate for a certain time (remittent fever): the latter is by far the more severe of the two forms of malaria. **Malarial fever.** **Two varieties.**

It is customary to divide the disease into three stages, which are sometimes preceded by certain ill-defined symptoms, such as vague pains in the back, loss of appetite, and general lassitude. The first or cold stage is so called because there is a feeling of chilliness, accompanied by shivering. The teeth chatter, and every effort is made to get warm by hovering over the fire, wrapping up in extra clothing, and drinking hot drinks. The temperature is, however, high and the pulse rapid. Soon, it may be a quarter of an hour, a curious glow of heat comes over the patient, which, at first pleasant, soon becomes most oppressive. This is succeeded by the third or sweating stage, when the skin acts freely, the fever declines, and the symptoms gradually disappear. The patient may now be free until the next paroxysm (intermittent), or the fever may only abate and not disappear (remittent), as we have mentioned. The paroxysms come on daily or only every other day, according to the type of the fever. The duration **Three stages.** **Cold stage.** **Hot stage.** **Sweating stage.**

of the disease varies from a month or more in the intermittent form to from ten to fourteen days in the remittent. A peculiarity about malaria is the tendency for its subjects to become affected, it may be many years afterwards, by manifestations of the malarial poison, of which anæmia and neuralgia are the most common.

Management. Fortunately we have a valuable remedy for malarial fever, namely quinine, which has a powerful action in cutting short or even arresting the paroxysms. The drug is usually given in a large dose some hours before the paroxysm is expected, and is continued throughout the course of the fever in smaller doses. During a paroxysm the patient must be made as comfortable as possible; he must be kept warm in the cold stage by extra clothing and hot bottles, and in the hot and sweating stages the body may be sponged with tepid water. Cooling drinks are grateful at this time. Alcohol is only needed when there is a tendency to collapse.

Influenza. The last of the specific fevers which requires mention is influenza, which occurs amongst us in epidemic form from time to time. After the lapse of about forty years the disease appeared again in this country at the close of the year 1889, and for the last few years there have been periodical outbreaks in different parts of the United Kingdom of varying degrees of severity.

Cause. Influenza is caused by a germ, which has probably now been definitely described and accepted by the profession. Infection is easily carried by the air, but it is seldom that the disease is conveyed directly from one person to another; hence isolation is probably not of any special value, but weakly and elderly people should be prevented as far as possible from mixing with those who have been attacked. One attack does not protect from a second; on the other hand, one attack predisposes to a second, and it is not uncommon to meet with those who have had the disease three or four times, or even oftener.

Symptoms. The symptoms are often various and ill defined. It is customary to describe three types, which may be combined in a given case, according as (*a*) the respiratory, (*b*) the alimentary, and (*c*) the nervous systems are more especially affected. In type (*a*) there are symptoms such as sneezing and the feeling of a severe cold, perhaps also cough and sore

throat. There is a tendency to bronchitis, and especially to pneumonia. In type (*b*) there is apt to be vomiting, diarrhœa, and pain in the abdomen. Type (*c*) presents the symptoms most suggestive of the disease—namely, severe backache, headache, pains in the limbs, and great prostration. Most cases of influenza present symptoms common to fever, and the temperature may reach 103° or 104°, occasionally still higher. The disease is apt to last three or four weeks.

Complications. The great danger of influenza is the severity of its complications, to which the weak and elderly are especially liable. Many lives have been lost by pneumonia occurring in the course of the malady. Again, the disease tends to leave various chronic ailments, and it has often been the cause of chronic ill health in the previously robust.

Management. The most important point in its management is never to treat a case lightly. Where the disease is only suspected, the patient should go to bed at once and summon medical aid without delay. Such a course as this will save much subsequent regret and anxiety, and will be most effectual in lowering the mortality. There is no cure for influenza, although many drugs, such as quinine, bicarbonate of potash, and salicylate of soda, have been recommended to check or arrest the disease. The patient must be saved all unnecessary movements, and the strength must be supported by plenty of nourishment. Alcohol is often required, especially when the nervous symptoms are well marked. The tendency to pneumonia, especially in the elderly, must never be lost sight of, and every care must be taken to prevent it by the avoidance of exposure to cold and chill.

CHAPTER XXII.

DISEASES OF THE DIGESTIVE SYSTEM.

In describing briefly the diseases of the digestive system all that can be attempted is to refer more especially to those with which the nurse is likely to come in contact in her work. The greater number of these diseases will not require any special management at her hands, and it will therefore be unnecessary to go into detail in describing them. It is supposed that the nurse is acquainted with the contents of chapters ii. and viii., and that she understands the elementary anatomy and physiology of the organs with which we are now concerned. This applies indeed to the study of the diseases of the other systems of the body, which can only follow a knowledge of the organs in a state of health.

Inflammation of the mouth. The cavity of the mouth is liable to various forms of inflammation, which may affect the lips, gums, tongue, and the inside of the cheeks. To this class of affections the name stomatitis is applied, of which the most severe and fortunately the rarest is a variety we referred to when speaking of mortification. It consists of a localised gangrene, affecting the inside of the cheek, which rapidly spreads. Other forms of stomatitis are the ulcerative and the condition commonly known as thrush. The former occurs in badly nourished children, and presents small ulcers more or less universally distributed over the inside of the mouth. The latter affection is caused by a parasite. The mouth and tongue are covered with whitish patches. A slop diet, consisting of milk and lime-water, milk-puddings, jellies, and such-like, will be required. Food should be given cold: hot dishes are generally painful. Locally, borax and honey or borax and glycerine are used to swab

out the mouth. Mouth-washes containing chlorate of potash, alum, or Condy's fluid are sometimes ordered. The bowels require to be regulated, and the general health improved by tonics.

Cautions concerning the effects of mercury. A word of caution about the importance of the nurse watching the condition of the gums in those patients who are under treatment by mercury, either internally or externally. This drug may produce a troublesome form of stomatitis, sometimes rapidly, but more often only after prolonged use. Tenderness of the gums is first complained of, and this may be followed by a feeling of the teeth becoming loose. This condition (mercurialism) was very common some years ago, but is now only occasionally met with. The nurse will at once report such symptoms, so that the drug may be stopped.

Teething. Teething is one of the infant's early troubles, and causes tenderness and swelling of the gums. Not uncommonly there may be vomiting and diarrhœa, and occasionally convulsions.

Acute tonsillitis, or quinsy. Acute tonsillitis, or quinsy, consists in an acute inflammation of one or both tonsils, which tends to go on to suppuration. The symptoms are often severe—shivering, fever, pain in the throat which is often referred to the ear, and trouble in swallowing. Exposure to cold, especially in the case of a person with enlarged tonsils, is the commonest cause. Steaming the throat and poulticing the neck generally give most relief in the early stages. Hot dry pads of wool, frequently changed, also form a convenient and good application to the neck. Sucking ice tends to relieve the discomfort in the throat. Hot and cold gargles containing chlorate of potash or borax combined with glycerine, are often ordered. The bowels are freely opened. Regarding the internal administration of drugs, aconite is a favourite remedy in the strong and robust; quinine and perchloride of iron (steel-drops) are used by many. When suppuration has occurred, the pus is evacuated by an incision made into the tonsil; not uncommonly the abscess bursts of its own accord, when immediate relief is obtained.

Acute and chronic sore throat. Causes. Acute and chronic sore throat arise from various causes, such as exposure to cold and damp, and excessive and prolonged use of the voice; also from anything which

irritates the throat, as the breathing of foul air and the constant drinking of raw spirit.

Symptoms. Most people are familiar with the symptoms produced by a sore throat—the partial or sometimes complete loss of voice, dryness of the throat, the constant and often ineffectual "hawking," especially when the disease is chronic, and the difficulty in swallowing. The nurse must remember that sore throat may be the symptom of a general acute disease, such as scarlet fever or diphtheria; hence the importance of medical advice being sought without delay. The inflammation may go on to ulceration of the throat.

Management. Many applications and remedies are in general use for the relief of sore throat in the form of gargles, sprays, and lozenges. Chlorate of potash, carbolic acid, alum, tannin, and borax are all made use of, in combination with glycerine, for gargling the throat. In the chronic forms more powerful remedies may be required, such as solutions of sulphate of copper, nitrate of silver, or sulphate of zinc. These are applied to the throat with a brush. The diet will be limited to slops, which are best given cold or lukewarm.

Inflammation and stricture of the œsophagus.

Causes. The œsophagus, or gullet, may be inflamed as the result of swallowing hot or irritant fluids or from other cause, when pain and difficulty in swallowing will be complained of. As a consequence of such inflammation the tube may be narrowed, giving rise to stricture, in the course of its length.

Stenosis, or stricture of the gullet, may arise primarily from pressure on the tube, produced by a swelling, either in its wall, as occurs in cancer of the œsophagus, or in its neighbourhood, as may happen in aneurism of the arch of the aorta. Again, it may be caused by the swallowing of a foreign body, such as a coin or a set of false teeth. Lastly, the condition may be what is termed spasmodic, when no local cause can be discovered. This is usually due to hysteria.

Symptoms. In addition to the difficulty in swallowing caused by the stricture there may be pain, especially in cases of advanced cancer, and vomiting of food mixed with mucus. Unless relief be given such cases sooner or later die of starvation.

Management. The management of inflammation of the gullet is directed to giving bland and easily swallowed food. In some cases

it may be necessary to resort to rectal feeding until the inflammation subsides. The treatment of stricture will vary with its cause. It is customary to stretch those which are not due to cancer or to aneurism by the passage of a long flexible solid rubber instrument, known as a bougie. This procedure (dilatation) is carried out at first every few days, to prevent contraction taking place. A soft rubber tube may be passed through the stricture and retained in position for so long a period as three weeks, providing no irritation is caused thereby. The patient is fed through this tube. Finally, in cases of cancer or impermeable stricture, an artificial mouth may be made in the stomach (see chapter xix.), through which nourishment is introduced. Cases of spasmodic stricture are managed on general lines. If the patient refuse to take food, it may be necessary to feed her through the stomach-tube.

Diseases of the stomach. **Dyspepsia.** **Causes.**

In passing in review the commoner diseases of the stomach it must be understood that indigestion (dyspepsia) may be caused either by changes taking place in the gastric juice secreted by the stomach, or by the food taken being unsuitable in quantity or quality. In most cases dyspepsia is what we call a functional disease—that is to say, it is not accompanied by any actual disease in the stomach. But, on the other hand, the symptoms of dyspepsia may be and usually are present in actual disease of the stomach, such as inflammation, ulceration, and cancer. We have, then, to differentiate between dyspepsia of functional origin and dyspepsia caused by actual disease of the stomach-walls (organic dyspepsia).

Symptoms.

The commoner symptoms of dyspepsia are a dirty furred tongue, a bad taste in the mouth, especially in the morning, thirst, altered appetite, sickness, often accompanied by retching and vomiting, a feeling of distension shortly after food, accumulation of wind (flatulence), pain over the stomach, constipation, more rarely diarrhœa, and headache. These symptoms are by no means present in every case, and they vary in their severity, according to the type and duration of the indigestion.

Management.

In managing such a case it is of the highest importance to carefully regulate not only the diet itself but the times for taking food. No general rules can be laid down, but the doctor will have to treat each case according to its

cause and its special requirements. The food ordered may require to be partially or completely predigested with the liquor pepticus or pancreaticus. Many such artificially digested foods are now on the market. Certain articles of food, when they are known to disagree, will have to be avoided. Among such may be placed tea, vegetables, cheese, sugar, pastry, and many other food-substances, all of which are generally contra-indicated. Occasionally in acute cases it may be necessary to empty the stomach with an emetic, to give the organ rest. A large number of drugs are in use in the treatment of dyspepsia; these include acids, alkalies, bitters, and general tonics. Alcohol is only to be taken under strict medical supervision.

So far we have been referring more especially to the management of "functional" dyspepsia. When the malady has its origin in actual disease of the stomach-walls, especially in the case of ulceration, indigestion must be looked upon as the evidence of the disease which we have to treat.

Inflammation of the stomach. Inflammation of the stomach may be acute or chronic; it is commonly known as gastric catarrh.

Ulcer of the stomach. Ulcer of the stomach (gastric ulcer) is most commonly met with among young servant-maids, and is generally **Symptoms.** associated with anæmia (see p. 279). A gnawing kind of pain is felt over the region of the stomach, and the pain is often also felt in the back between the shoulders. The vomited matter is sometimes described as being like coffee-grounds; this is due to the stomach contents being mixed with blood, which has been derived from the surface of the ulcer, and has been acted upon by the gastric juice. Vomiting of blood (hæmatemesis) is very characteristic of ulcer and cancer of the stomach. Such patients are generally hungry, but are afraid to eat on account of the pain produced as soon as the food comes in contact with the ulcer.

Dangers of gastric ulcer. The dangers of an ulcer of the stomach are twofold: (1) the opening into a large blood-vessel, with consequent alarming hæmorrhage, the blood being in part vomited and in part passed by the bowel; and (2) perforation of the stomach, with passage of its contents into the abdominal cavity—this sets up acute peritonitis, and death usually follows.

Such patients, then, require very careful dieting; indeed, in the early stages, feeding by the bowel may be necessary. The stomach must be rested, so as to promote the healing of the ulcer. Milk is the chief article of diet, and it is best mixed with lime-water or soda-water, in equal parts at first, then two parts of milk to one of the lime- or soda-water. The food given often requires to be artificially digested. This must always be done in the case of nutrient enemata. Soothing remedies, such as bismuth, are indicated; and morphia, given either by the mouth or injected under the skin, is often necessary to relieve pain. In the case of vomiting of blood the nurse may give small pieces of ice to suck, and apply an ice-bag over the region of the stomach until the doctor's arrival. When it is suspected that perforation has occurred, on no account must anything be given by the mouth. The patient must be kept at absolute rest. Surgical interference in such cases, if undertaken sufficiently early, has sometimes saved life. **Management.**

Cancer of the stomach is a common disease, and one which is only curable by operation in certain selected cases. **Cancer of the stomach.**

The special symptoms, in addition to those associated with the consequent dyspepsia, are hæmatemesis and progressive wasting and weakness. The vomit is usually of a greyish-black colour. The organ becomes enlarged (dilated), when the obstruction involves the pylorus, as is usually the case, owing to the hindrance of the passage of the contents into the duodenum. In such a case the contents, gradually accumulating, are vomited up in whole or in part. The cancerous swelling can often be felt through the walls of the abdomen. **Symptoms.**

In the management of this disease, where a curative operation is out of the question, all that can be done is to support the strength and to relieve the symptoms, giving the stomach as little work to do as possible. Washing out the stomach with a syphon-tube often gives much relief. A weak solution of Condy's fluid is the best to use. The washing out is best performed shortly before a meal. This procedure is also of much benefit in cases of chronic dilatation of the stomach apart from cancer, which is due to the stretching of the walls of the organ. An operation is sometimes performed to prolong life, when the disease cannot be removed, by making an opening in the wall of the **Management.**

stomach, which communicates directly through a similar opening made into the small intestine (jejunum), thus overcoming the obstruction at the pylorus.

Inflammation of the bowels. The different regions of the bowel are liable to be affected by inflammation, to which the general name enteritis is applied. When the blind pouch, or cæcum, and the vermiform appendix, which, it will be remembered, is a narrow sac of variable length opening out of it, are involved, the condition is known respectively as typhlitis and appendicitis.

Cause. The commonest causes of inflammation of the bowels are cold, irritating food, hard masses of fæces, and foreign bodies, such as gall-stones and fruit-stones.

Symptoms. The symptoms depend very much on the part of the bowel which is attacked and the character of the inflammation. When the small intestine is inflamed, diarrhœa is generally a prominent symptom; whereas constipation is more common in typhlitis and appendicitis. Colicky griping pains are often complained of. There are usually a furred tongue, loss of appetite, and sometimes vomiting. When the colon is attacked, it is not uncommon for ulceration to occur, when the motions will contain blood and mucus, and perhaps cast-off sloughs from the surface of the ulcers. In typhlitis and appendicitis there is also apt to be inflammation of the tissue which surrounds the cæcum and vermiform appendix, which often goes on to suppuration. The resulting abscess then requires to be opened and the pus evacuated.

Management. In treating inflammation of the bowels the most important principles are rest and the relief of pain and other symptoms, such as diarrhœa and constipation. The favourite drugs for the relief of diarrhœa are opium, bismuth, chalk, lead, iron, and sulphuric acid. Opium not only checks the diarrhœa, but is the most valuable remedy to allay pain. It must, however, be given with caution, especially in young children, who bear it badly. Local applications, such as poultices or hot stupes, may be made to the abdomen, when there is severe griping pain. Constipation is best relieved by castor oil and simple enemata. We procure rest for the bowel by restricting the diet to fluids, which should be non-irritating and given in small quantity. Until the acute symptoms have subsided a purely slop diet is adhered

to. Occasionally we may meet with a case presenting all the symptoms of cholera, such as we have already described (see chapter xxi.). In such a case probably the best thing which can be given is water-arrowroot, containing a little brandy, according to the doctor's direction. Lime-water and barley-water are harmless, and relieve the thirst. In hot weather the milk and water should be boiled before use, when there is a tendency to diarrhœa, and always when they are not above suspicion.

Dysentery. The large intestine is liable to be affected by a special form of inflammation, to which the name dysentery is applied. There are probably two forms of this disease—a tropical variety, which occurs under similar conditions to those which favour the malarial poison (see Malaria, chapter xxi.), and one which is met with from time to time in our own country as a result of overcrowding in such institutions as asylums and prisons. Isolated cases of dysentery occurring under other circumstances in this country are rare.

Symptoms. The special symptoms of this affection are a griping pain in the abdomen and a constant desire to go to stool, accompanied by a burning sensation in the rectum when the bowels act. The stools are usually scanty, and soon come to contain blood, mucus, and shreds of mucous membrane, derived from the large ulcers which have formed in the wall of the large bowel. There is a rise of temperature and general disturbance of the system.

The most valuable drug in the treatment of tropical dysentery is undoubtedly ipecacuanha. In English dysentery it is not so efficacious. It must be given in large doses. At first it is probably soon vomited, but the stomach generally soon comes to tolerate it. Castor oil and laudanum are sometimes given with much benefit, either by the mouth or by the rectum, to relieve the griping. A favourite remedy with some is the starch-and-opium enema. The diet must be light and nutritious, consisting for the most part of milk, milk-puddings, gruel, broth, eggs, and jellies. Brandy or other stimulant is often required while the symptoms are acute, always in severe cases. The evacuations from the bowels must be regarded as infectious, and are best dealt with as the stools in typhoid.

Intestinal obstruction. The causes of obstruction of the bowels (intestinal obstruction) are numerous; they are best regarded as those which

Causes. affect the bowel from the outside, from the inside, and, thirdly, the wall of the bowel itself. Examples of the first group of causes are a strangulated hernia (see chapter xix.) and a tumour pressing on the bowel ; of the second group, large masses of fæces and foreign bodies, such as gall-stones ; and of the third group, cancer of the bowel and the condition known as intussusception, which usually occurs in children. This form of obstruction takes place when one portion of the bowel slips into a portion below it, just as we might push in the finger of a glove. It usually occurs in the ileum, which slips down into the cæcum.

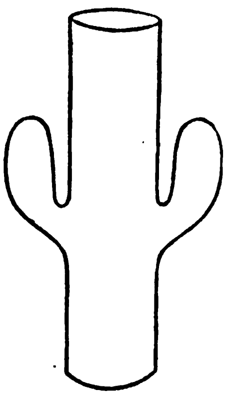


FIG. 69.
DIAGRAM TO ILLUSTRATE INTUSSUSCEPTION.

Whatever may be the condition which causes intestinal obstruction, the symptoms do not differ materially, but vary in their severity according as the obstruction is acute and entire or chronic and partial. We have already referred to one form of obstruction, namely strangulated hernia, and have pointed out the necessity of early surgical interference to release the pinched and strangulated bowel.

Symptoms. Briefly, the chief symptoms of obstruction of the bowels are constipation of sudden or gradual onset, usually accompanied by vomiting, which, at first consisting of the stomach contents, soon comes to contain bile, and, later on, becomes fæcal in character. In suddenly developed cases there is collapse, feeble pulse, clammy perspiration, and an anxious expression. The abdomen is swollen and tender, and there is usually pain, which may be generalised over the whole region or confined to one particular area. Under circumstances such as these the doctor is led to examine for a hernia or tumour or other cause to account for the symptoms. It may be impossible to detect the cause until the abdomen has been opened.

Management. The management of such cases depends on whether an operation is required or no. It is customary to try

less extreme measures before resorting to an operation in many cases, although sometimes an immediate operation offers the only chance of saving life. Opium or morphia is used by some to relieve pain and procure rest; others, however, object to their use, as tending to mask the symptoms, and thereby placing the patient in a false position of security. Generally relief obtained by these drugs is only temporary. Belladonna is preferred by many to relieve the spasm of the gut. Enemata, either plain or containing olive oil, are often ordered. They must, however, be used with great caution, otherwise the bowel may be ruptured. The nurse must carefully note if any wind (flatus) is passed by the bowel, and report accordingly. Soothing applications to the abdomen are grateful and relieve pain. An ice-bag often acts in the same way.

In cases of recent intussusception, before an operation is resorted to, the injection of water or air into the rectum is undertaken, to distend the bowel, and thus cause the gut to right itself. The child is generally inverted while this is carried out. Air is conveniently introduced by means of a pair of bellows. The diet must be extremely light. Usually only sips of hot water or morsels of ice will be allowed until the obstruction has been overcome. Stimulants are nearly always necessary. An operation may have to be resorted to sooner or later to relieve the obstruction. In cases where the bowel is bound down by a constricting band, this will be divided.

Again, an intussuscepted piece of gut may have to be reduced by operation. It may be necessary to remove a portion of the bowel, either on account of serious damage caused by the obstruction or because of its implication by disease, usually cancer.

The after-treatment of such operations will not differ from that of other abdominal operations. This has been already described (see chapter xix.).

Intestinal worms.

There are many varieties of worms which are liable to infest the alimentary tract. Of these we shall select three for mention—namely, (*a*) the tape-worm, (*b*) the round-worm, and (*c*) the thread-worm.

Tape-worm.

The first variety is usually introduced into the body with meat, especially pork, which has been insufficiently cooked. These worms are apt to cause pain in the

abdomen and other symptoms which are for the most part indefinite. Generally their presence is not discovered until they are passed, usually in part, by the bowel. It is important to search the motions to discover the head, which is the smallest part of the worm. Unless this is passed the worm simply develops again. Many drugs are given with the object of killing the worm or to favour its detachment from the wall of the bowel; of these the most commonly used is the extract of the male fern (*felix mas*). The selected drug must be given fasting in the early morning, the bowels having been freely emptied by a large dose of castor oil or other aperient administered on the previous evening. The bowels must be emptied again after the drug has been taken, otherwise the worm, which has become separated, but perhaps not killed, may fasten on again.

Round-worm. The round-worm may occur singly or in large numbers. Its length varies from ten to fifteen inches. The symptoms produced by it are also indefinite, and it is as a rule only the passage of the worm which can be regarded as evidence of the disease. This worm and the one next to be described are more common in children, and are liable to cause various nervous symptoms, such as convulsions, picking of the nose, and grinding of the teeth. The favourite remedy here is santonin, given in a manner similar to that already mentioned.

Thread-worm. The thread-worm is so called because it resembles little bits of cotton. These worms occur in large numbers in the large intestine and rectum, and set up considerable irritation, especially around the anus. Santonin is also of value here; but, from their position, these worms can be better dealt with by enemata containing quassia or common salt. Cleanliness is of great importance, and a weak carbolic lotion (1-60) may be used with advantage to sponge the parts.

Peritonitis. We have from time to time had occasion to refer to peritonitis, a disease which the nurse may not infrequently

Cause. meet with in its acute or chronic form. It may originate in a person previously healthy or occur as a complication of another disease. Again, it may result from various operative procedures on the abdomen or from child-birth. The conditions under which peritonitis may arise are therefore various. In describing the disease we shall

consider a case of acute general peritonitis, caused by the perforation of the stomach or bowel, as we have seen may occur in ulcer of the stomach or in the course of typhoid fever. It will be easy to understand how liable the peritoneum is to be attacked by inflammation, when it is remembered that it not only lines the whole of the abdominal cavity, but serves also as a more or less complete covering for the organs contained therein.

Symptoms. One of the earliest symptoms of acute general peritonitis is a severe pain in the abdomen, which is accompanied or preceded by shivering and a rise of temperature, or an increase of fever when this is already present. The patient lies with his knees drawn up in bed to relax the abdominal muscles. He often cannot even bear the weight of the bed-clothes. He keeps the abdomen as still and rigid as possible, and the nurse will notice that only the chest moves during respiration. Vomiting and hiccough are usually well-marked symptoms, the tongue is coated and dry, and the bowels are usually confined. The expression is anxious, and the patient looks seriously ill. The pulse is rapid, and the temperature commonly reaches 103°, and may be higher. The disease is always a serious one, and when caused by perforation may prove rapidly fatal.

Management. The first principle in managing a case of peritonitis is to give rest to the inflamed part. This is best obtained by opium, which is our most valuable remedy. It keeps the bowels at rest, relieves the pain, which may be unbearable, and procures sleep. The bowels must be relieved, when required, by enemata, and on no account must a bed-pan be used. Locally, hot fomentations or poultices, which must be very light, may be used with advantage, when they can be borne. Turpentine or laudanum may be sprinkled on the fomentations. These produce a sense of comfort, and tend to relieve the flatulent distension so common in the disease. Ice-bags and cold compresses are recommended by some in the early stages. A cradle is always required to remove the weight of the bed-clothes, and a pillow should be placed under the knees.

It is obvious that the management of peritonitis must be modified according to its cause. For instance, in the variety we are more especially concerned with, namely peritonitis caused by perforation, nothing should be given

by the mouth. In other forms of the affection the food must be as light as possible, and the less given the better for the first few days. During this period milk and beef-tea will be chiefly depended on. Ice may be given to suck; also sips of hot water, to relieve thirst. Stimulants are usually required, always when the patient passes into the typhoid state, and when there is marked collapse. In cases of perforation, or where it is even suspected, all nourishment, including brandy, is given by the rectum.

Chronic peritonitis. Chronic peritonitis is commonly due to tubercular disease or cancer. Like acute peritonitis, it may be generalised or localised to a limited part of the peritoneum. Two important points in connection with chronic general peritonitis are the matting together of the bowels and other viscera by fibrous bands—adhesions—which are apt to cause pain of a dragging nature, and the effusion of fluid into the abdomen, often in considerable amount.

The management of chronic peritonitis is directed towards improving the general health by tonics, and to promoting the absorption of the fluid and separation of the adhesions by remedies such as iodide of potassium internally, and blisters, iodine, mercurial ointment (Scott's dressing), and pressure externally. The disease, when due to cancer, terminates fatally sooner or later.

We conclude our account of the diseases of the alimentary system with some of the affections to which the liver is liable.

Diseases of the liver.

Jaundice. A common symptom of derangements of the liver is jaundice. The prominent feature of jaundice is the yellow coloration of the skin, resulting from the absorption into and circulation in the blood of the constituents of the bile, which is apt to occur under various circumstances.

Cause. It most commonly arises from some obstruction to the outflow of the bile in its course from the liver to the duodenum, whither, it will be remembered, it is carried by the bile-duct. This obstruction may be caused by inflammation of the biliary channels, by swelling of the orifice of the bile-duct in the wall of the duodenum, as commonly occurs when this part of the bowel is inflamed (catarrhal jaundice), or from the blocking of the ducts by one or more gall-stones. The term obstructive jaundice, which is applied to cases such as these, explains itself. We

have said that the skin becomes yellow in colour. The depth of colour varies from a pale lemon tinge to a very decided green tint. The sweat and the urine both contain bile.

Symptoms. Symptoms of dyspepsia are usually present. The bowels are constipated, and the motions are pale like clay, due to the absence of bile in the intestine. There is itching of the skin, caused by irritation of the nerves in the skin by the bile. Usually patients the subjects of jaundice are inclined to be melancholy and morose.

Management. The management of a case of jaundice demands in the first place the discovery of its cause. The diet is limited to slops for the first few days. The functions of the liver require to be stimulated by special drugs which act on that organ, one of the commonest of which is calomel; but each case of jaundice is treated in accordance with the disease which has produced it. The itching of the skin is relieved by using lotions containing weak nitric acid, vinegar, borax, or washing-soda, with which to sponge the body.

Inflammation and abscess of the liver. Inflammation of the liver is for all practical purposes to be regarded as a tropical disease, which generally manifests itself as an abscess of the organ. We have already referred to its relation to dysentery and the malarial poison. Abscess of the liver is always a serious affection, and one which often presents difficulties in diagnosis. Quinine is our most valuable remedy in this disease. When pus is suspected, an aspirating-needle is introduced into the liver-substance, and the matter withdrawn. The liver may become much enlarged in some of the diseases to which it is liable, such as cancer: in other affections, on the other hand, the organ may become greatly shrunken and diminished in size.

Gall-stones and biliary colic. The formation of gall-stones depends on a change in the character of the bile, which becomes thicker than usual and more viscid. They are more commonly multiple than single, and may be found in any portion of the biliary passages. The gall-bladder is often found, after death, to be filled with gall-stones, which have given rise to no symptoms during life. Gall-stones occur more commonly in females, usually after middle life, as a result of sedentary habits, which favour their formation. They vary in size from a pea to a hen's egg. The passage of one or more of these gall-stones into the bile-duct is apt to cause an

excruciating colicky pain, commonly known as biliary colic, which continues until the stone passes back into the gall-bladder or onwards into the bowel. Small stones may, however, be passed without producing any marked pain. In suspected cases the nurse must carefully look out for the passage of one or more stones in the motions. She will notice that when a stone is faceted—that is to say, impressed with a mark from contact with another stone—there is at any rate one, probably several stones, remaining in the gall-bladder. In examining the motions of the gall-stones they should be well diluted with water.

Management. To relieve the agonising pain of biliary colic a hypodermic injection of morphia is required. This is commonly combined with either a hot bath or hot stupes applied to the abdomen. Sometimes the inhalation of chloroform is required to give relief. When the paroxysm of pain has been overcome, efforts are made to dissolve the stones by various drugs. The patient is carefully dieted, avoiding all fatty and sugary foods; and moderate exercise, when practicable, is enjoined.

Among other diseases of the liver are two which we shall very briefly allude to, as it is possible that the nurse will meet with them.

Hydatid disease. The first of these is known as hydatid disease. This consists of one or more cysts, often of large size, produced by the eggs of a parasite, which are introduced into the body with the food or drinking-water, and develop there. The cyst is filled with a clear straw-coloured fluid. The disease is a serious one. The management consists in drawing off the contents of the cyst with an aspirator. Hydatid cysts, it may be mentioned, are liable to affect other organs, such as the lungs or brain, but the liver is their commonest situation.

Malignant jaundice, or acute yellow atrophy of the liver. The second of these affections has received the names malignant jaundice and acute yellow atrophy of the liver. The disease is a very fatal one. Among other symptoms of this affection are increasing weakness, rapid shrinking of the liver, jaundice, at first slight, and, later on, well marked; also a condition of stupor, passing into coma. Drugs are of little avail.

CHAPTER XXIII.

DISEASES OF THE BLOOD AND OF THE ORGANS CONCERNED IN ITS CIRCULATION.

A. Diseases of the blood and ductless glands.

By far the commonest disease to which the blood is liable is that known as anæmia, by which we mean an impoverishment of the blood, from whatever cause arising. The blood may be diminished in quantity or may be deficient in one or more of its constituents. The term anæmia is thus a wide one. It will, however, be sufficient for our purpose to describe the disease as it is commonly met with, reserving for a separate description that special form of anæmia to which the word "pernicious" is prefixed. **Anæmia**

The causes of anæmia are numerous, including as they do an insufficient introduction into the body of blood-forming material, interference with the digestion and assimilation of such material, all conditions which tend to cause an excessive waste of the tissues of the body, destruction of the elements of the blood, and excessive losses of blood. It will thus be understood that anæmia is met with under varying conditions. Finally, we must not lose sight of the effect of unhealthy surroundings, vitiated air, and absence of sunlight in causing this disease, all of which are a fertile source of anæmia, especially in our large towns. **Causes of anæmia.**

Anæmia affects chiefly the female sex, and especially girls and young women. Such cases present a more or less well-marked pallor, with sometimes a yellowish tinge of skin. The lips, gums, and mucous membranes generally share in this pallor.

The chief symptoms complained of are shortness of breath, palpitation, and general languor. Digestive troubles and constipation, together with headache and sometimes dizziness, are also often present. The blood, when shed, **Symptoms of anæmia.**

is of a watery appearance, and it is found on examination to be deficient in the number of red corpuscles.

Management of anæmia. The management of anæmia consists of rest, generally in bed for the first few days, a generous and easily digested diet, regulation of the bowels, plenty of fresh air and sunshine, and, when advisable, moderate exercise. Fortunately we have a drug which is of the highest value in most cases of anæmia—namely, iron. This drug may be given in many forms; one of the commonest modes of administration is in pill form—the well-known Blaud's pill. Sometimes iron is given as steel-drops (tincture of the perchloride of iron) or as a powder (reduced iron) sprinkled on bread-and-butter. Iron is given with or after food, but before it is prescribed the doctor seeks to relieve the indigestion which is so commonly present, and to regulate the bowels. Constipation is treated by such drugs as aloes, cascara sagrada, and saline aperients.

Pernicious anæmia. Pernicious anæmia presents symptoms somewhat similar to those already mentioned; they are, however, more severe than those of simple anæmia, and the disease is, for the most part, a fatal one. This form of anæmia is probably due to a destruction of the elements of the blood by a form of poison at present unascertained. It usually affects the middle-aged and elderly, and its chief characteristic is the failure to improve under iron, which we have seen to be of so great benefit in ordinary anæmia. The disease is a very insidious one, and consequently medical advice is seldom sought until the affection is far advanced. The pulse comes to be rapid, weak, and irregular; debility and breathlessness are marked, and death usually ensues from exhaustion. Another special feature of the disease is the liability to hæmorrhages from the nose and other sources, but especially into the back of the eye, as shown by the ophthalmoscope. It is doubtful if the disease is ever recovered from.

Management of the disease. The patient must be saved every unnecessary exertion; indeed, in advanced cases it may be necessary to forbid any movement in bed. The diet should be as nourishing as possible; milk, eggs, beef-tea, meat-juice, or raw beef minced up finely will be largely depended on. Brandy or other stimulant is probably always necessary. Drugs are seldom of much use. Arsenic is certainly the most

valuable. The administration of bone-marrow has been attended with some success; this is given to further the formation of the red corpuscles which are being destroyed, since the bone-marrow is now regarded as one of their sources.

People who are known as bleeders are occasionally encountered. After the extraction of a tooth or as a result of a trivial cut, for example, such people will bleed profusely, and it may be impossible to stop the hæmorrhage. Probably there is some defect in the coagulating properties of the blood. Bleeders generally die early in life. There is no cure for this condition. **Bleeders.**

Scurvy (scorbutus) is a rare disease in our own country, but we are all familiar with the scourges caused by it in the Arctic expeditions, when the food-supplies were ill chosen and restricted. It has been proved that the absence of fresh meat and vegetables from the diet is the chief cause. The administration of lime-juice is of much value, more especially as a preventive under circumstances where the disease is liable to occur. At least half an ounce of lime-juice is necessary every day in the case of long voyages with a restricted dietary, in order to maintain the health of the crew. **Scurvy.**

The nurse may occasionally meet with cases characterised by hæmorrhages, usually small but sometimes extensive, into the skin. Such patients have bluish-red spots on the body and lower limbs of varying size, which gradually change in colour to green and brown, as does a bruise. Such a condition is known as purpura. The simple form of the disease, where the hæmorrhages are small and confined to the skin, is usually soon recovered from; but the more severe variety, where the hæmorrhages are more extensive, and affect also the mucous membranes of the nose, the stomach, and the bowels, is a much more serious malady. **Purpura simplex (simple purpura).** **Purpura hæmorrhagica (hæmorrhagic purpura).**

The management consists in keeping the patient at rest, generally in bed (always in the severe form of the disease), on a nutritious and light diet. Drugs such as iron and arsenic are prescribed to improve the condition of the blood, and turpentine, ergot, and lead to control or arrest the hæmorrhage in the cases of hæmorrhagic purpura. Opium may be required to procure sleep, and stimulants **Management of purpura.**

are generally ordered in at all severe cases to overcome the debility and strengthen the weakened heart.

Ductless glands. There are certain glands in the body which are known as ductless glands because they have no canal or duct in connection with them, as, for instance, has the liver, the pancreas, and the kidneys. Examples of such glands are the spleen; the thyroid, which, it will be remembered, lies in relation to the trachea in the neck; and the supra-renal capsules, which, so to speak, "cap" the kidneys on either side. The spleen plays an important part, as we have seen, in the formation of the blood. It is, however, about the two latter glands that we are now about to speak. The thyroid gland pours into the blood a substance which is essential to the well-being of the body; for when this substance is absent from the blood, certain well-marked changes result. This has been proved by experiment; for the removal of the gland, both in the case of man and the lower animals, causes these symptoms to be developed.

Myxœdema: its symptoms. These phenomena constitute the disease known as myxœdema. The outstanding sign of myxœdema is a peculiar thickening and swelling of the skin, best seen in the face, giving to the features a coarse, stupid, and heavy expression. This swelling is somewhat similar to that seen in dropsy of the tissues (œdema), but differs from it in being solid in character and not pitting on pressure, as does a dropsical limb. The skin becomes dry, owing to a diminution of the perspiration; the hair is thin and coarse. There are well-marked symptoms which are referable to the nervous system, notably a slowness of speech and deficient intelligence. The patient, too, is slow and clumsy in his movements. He feels the cold more than usual. The disease is more commonly met with in females. Myxœdema is our best example of those diseases which are treated by supplying that substance the lack of which is unquestionably the cause of the malady. The treatment of this disease by the administration, in one form or another, of the thyroid gland or glands of one of the lower animals, usually the sheep, is one of the most brilliant advances in the treatment of disease during the last few years.

Treatment of myxœdema. The thyroid is now usually compressed into tabloids and given by the mouth. The fresh gland used to be given minced up, or an extract derived from it was injected

under the skin. These latter methods of giving the gland have now for the most part been discarded in favour of the tabloids. The effect of this treatment is often very rapid, and every medical man now looks on the disease as being curable. The nurse must remember the proclivity to cold which is one of the features of the disease. The patient must therefore have warm clothing, and the room should be maintained at an equable temperature.

Addison's disease. The suprarenal capsules have of late years come into prominence in connection with a disease which was first described by Addison and which bears his name. The cause of this disease we do not know, but we know that after death one or both of the capsules have been found to be the seat of disease, probably of a tubercular nature (see Tuberculosis, chapter xxiv.).

Leading features of the disease. The leading features of the disease are: (1) a peculiar bronzing, which affects the skin and sometimes also the mucous membranes, such as the lining of the mouth; (2) marked anæmia; (3) progressive debility, with a feeble action of the heart; and (4), as already mentioned, a diseased state of the suprarenal capsules, which, of course, is only demonstrated on post-mortem examination, its existence merely being suspected during life. In addition to these symptoms there are usually present vomiting and diarrhœa.

Management of the disease. The nurse must bear in mind two points in her management of a case of this disease: (1) The irritability of the stomach, which will, in severe cases, often refuse almost every form of nourishment. The diet is framed on the same lines as in pernicious anæmia, raw pounded meat and meat-juice being of the greatest value. Nourishment is generally best given cold. (2) The profound weakness. This demands rest in bed except in early and mild cases, and the avoidance of exertion. The doctor will generally prescribe alcohol and other drugs to strengthen the action of the heart and to improve the digestion. The onset of the malady is gradual. Unfortunately we have at present no cure for Addison's disease, as we have for myxœdema. The suprarenal glands have been given with benefit in a manner similar to the administration of the thyroid gland, but this mode of treatment has not yet given us any brilliant results.

Hodgkin's disease. There is a disease known as Hodgkin's disease (or lymphadenoma), which affects the spleen and the lymphatic glands. Groups of glands become enlarged, most commonly those in the neck, and there is anæmia, elevation of temperature, and wasting. The disease is a very fatal one. Arsenic, iron, and cod-liver oil are usually prescribed. Bone-marrow has occasionally given good results.

Begin

B. Diseases of the organs concerned in the circulation of the blood.

These diseases include those of the heart and blood-vessels, the former of which we shall speak of first.

Diseases of the heart. We have seen that the heart is essentially a muscular organ, enclosed in a bag or sac, the pericardium, and lined with a membrane, the endocardium, which assists in the formation of the valves. Each of these structures is liable to be affected with inflammation, but it is to inflammation of the pericardium (pericarditis) and of the endocardium (endocarditis) that we shall alone refer. These diseases are not only serious in themselves, but in many cases they leave permanent damage, which causes, in the case of endocarditis, valvular disease of the heart.

Dilatation of the heart. Again, as a result of disease of the heart, or as a sequence to other serious disease, the muscular walls of one or more of the cavities may become weakened and stretched, giving rise to dilatation of the heart, with enlargement of these cavities. As a consequence of such enlargement the valves may cease to completely close the openings into and out of the affected chamber or chambers, another origin of valvular disease.

Hypertrophy of the heart. Finally, the muscle of the heart may be increased in size from over-action of the organ. Up to a certain point this change is not only harmless, but may be actually advantageous, to allow of the heart doing its increased work efficiently; but beyond this point the condition is apt to be serious and to be accompanied by danger. Such an increase of the muscular substance of the heart is known as hypertrophy.

Having briefly sketched some of the changes to which the heart is liable, let us consider the effects and the symptoms produced by such changes and their management.

Pericarditis. The causes of pericarditis are numerous. It may be the

result of an accident, such as a wound penetrating the chest-wall; again, it may occur in the course of pleurisy or kidney disease; but by far the most common cause is the poison of rheumatic fever; and the nurse must realise that this poison is very liable to affect the heart, insomuch that pericarditis or endocarditis or both are very commonly present in an attack of this complaint. A common question put to a patient the subject of serious heart disease is, "Have you ever had rheumatic fever?" and the answer is very often in the affirmative. **Causes.**

The pericardium is in health a shining smooth membrane, similar in character to the pleural membrane, which covers the lungs and lines the chest-wall, and to the peritoneum, which we have seen to line the abdomen and cover the organs contained therein.

Changes which occur in the pericardium. This character is lost when inflammation occurs, the inner surfaces becoming covered with a sticky material; fluid is soon poured out, which varies in amount from one or two ounces to it may be as much as three pints. The fluid (effusion) may be absorbed in whole or only in part.

Symptoms. The symptoms are often at first indefinite; but if the disease occur in the course of rheumatic fever, its early recognition is more probable. There is usually some fever and pain over the surface of the heart early in the disease, due to the inflamed surfaces of the membrane rubbing against each other with every beat of the heart. This produces the peculiar rubbing sound (friction) which the doctor hears on listening with his stethoscope over the region of the heart. When the surfaces of the pericardium become separated by the fluid which is poured out, the pain ceases, as the inflamed surfaces are now no longer in contact. The patient usually looks anxious and ill, and there is embarrassed breathing and irregular action of the heart, according to the amount of fluid present, as is evidenced by the character of the pulse. If there is much fluid in the pericardium, the nurse may notice a bulging of the chest-wall in this region. The disease is apt to be complicated and followed by serious affections, which cause us to look on pericarditis as a grave malady, especially when it occurs in the course of another disease.

Management. Complete rest in bed is necessary in the management of the disease, and as the patient is usually seriously ill he

willingly submits to this. The usual remedies are employed by the doctor to relieve pain, to reduce fever, and to procure sleep. If pericarditis occur in the course of rheumatic fever or kidney disease, the management will be modified accordingly. Locally, in the early stages, hot applications over the heart are most suitable; they should, however, be light. When fluid is poured out, measures will be taken to limit its output and to promote its absorption. For this iodine liniment or blisters may be applied to the chest over the heart. Occasionally the fluid, by its quantity, may cause alarming symptoms, which will call for immediate relief. In such a case the medical man may be called upon to draw off some of the effusion. The chest is thoroughly cleansed with an antiseptic lotion, and a small incision made in the selected spot. Through this incision a clean exploring or hypodermic needle is carefully introduced, and a small quantity of fluid removed. For the relief of the embarrassed breathing (dyspnœa) and to rouse the failing heart, drugs, such as ether, strychnine, (hypodermically), sal-volatile, and alcohol (usually in the form of brandy), will be chiefly depended on. During convalescence one of the group of drugs known as the heart-tonics is frequently prescribed. Included in this group are remedies such as digitalis, strophanthus, nux vomica, and its active ingredient strychnine, and iron in its various forms.

Removal of fluid from the pericardium.

Diet. The diet in pericarditis will usually be that of the disease of which the pericarditis is a complication; for, as we have said, it more commonly happens that the disease occurs in the course of another affection. Milk and beef-tea will, during the acute stage, be chiefly depended on. Cooling drinks are to be given in moderation. We have spoken of alcohol in cases of severity, but the doctor often orders it regularly throughout the illness apart from any emergency.

Endocarditis. Endocarditis is usually a far more serious disease than pericarditis, and in one of its forms, the ulcerative, the disease is a very fatal one. The damage done to the heart by inflammation of the endocardium is often considerable and irreparable.

The seat of the disease. The disease affects almost solely the valves of the heart, and especially those on the left side, so that the seat of the disease may be regarded for all practical purposes as

the mitral and aortic valves. The substance of the valve becomes inflamed and thickened, more rarely ulcerated. As a result of this the segments of the valve may be damaged to a greater or less extent, giving rise to narrowing (stenosis) of the orifice which they guard, or to inability to completely close the opening, which allows the blood to return in part to the chamber whence it came (regurgitation). In the latter case the valve is described as being "incompetent." If the inflammation has not been too severe, the valve may entirely recover.

Causes of endocarditis. The causes of endocarditis are many, by far the most common being the poison of rheumatic fever.

Symptoms. The symptoms are probably even less definite than are those of pericarditis. There is a general feeling of illness, often associated with a rise of temperature. In the case of ulcerative endocarditis the symptoms are extremely severe, and the patient frequently passes into the typhoid state (see chapter xxi.).

Management. The management of the disease does not differ from that of pericarditis so far as general principles are concerned, such as diet and complete rest in bed. We desire to keep the circulation of the blood as quiet as possible, to permit of the healing of the inflamed valve, and also to prevent any fragments (vegetations) from being separated from the edge of the valve by the force of the blood-current, in which case they would be carried in the blood-stream to different organs (often the brain), and, lodging there, would produce serious results. Such a complication as this (embolism) is by no means uncommon during the course of an acute attack of the disease. Drugs are prescribed to relieve distressing and urgent symptoms and to combat any other disease, such as rheumatic fever, which may be present at the same time. Stimulants are almost always necessary in severe cases, especially in patients who have fallen into the typhoid state. Locally, iodine or blisters will often be ordered by the medical man, as in pericarditis.

Valvular disease. We have already had to refer to valvular disease in connection with inflammation of the heart, and we may now mention that a large proportion of cases of valvular disease owe their origin to endocarditis. We have said that endocarditis attacks in nearly every instance the left

side of the heart, on account of the greater pressure to which this side is subjected; consequently we should expect that valvular disease affects more commonly the mitral and aortic valves, and this is in fact the case. The tricuspid valve rarely becomes inflamed in the first instance. It has been pointed out that a diseased valve may give rise to two conditions: (1) narrowing of the orifice which it guards, and (2), through inability to close that orifice, regurgitation of blood. Narrowing (stenosis) of the orifice may be present at the same time as regurgitation.

Explanation of a case of valvular disease. To explain an ordinary case of valvular disease let us select as our example a case of mitral regurgitation, the result of an attack of endocarditis. We know that with each beat of the heart the blood is driven from the right and left ventricles into the pulmonary artery and aorta respectively. Now, if the blood in the left ventricle is allowed to return in part into the left auricle with each beat of the heart, instead of passing entirely into the aorta, through inability of the mitral valve to completely close the auriculo-ventricular orifice, what happens? It is obvious that in order to meet this difficulty the auricle must work harder to fulfil its increased task and to empty its cavity. This increased work may for a short time be performed satisfactorily, and, as a result, the muscular wall of the chamber will become thicker; but soon the auricle breaks down under the increased strain, and its cavity becomes enlarged, owing to the stretching of its muscular wall. Now the blood begins to stagnate, and this stagnation gradually spreads backwards to the lungs. To overcome this the right ventricle takes on the increased work, and by propelling its blood more forcibly into the pulmonary artery thus endeavours to drive the blood through the lungs. But this mechanism tends to give way in time, when the "hypertrophy" of the ventricular walls gives place to "dilatation," as we found to be the case in the left auricle. The increasing size of the right ventricle tends also to affect the tricuspid orifice, so that now the tricuspid valve may fail to completely close the opening, and tricuspid incompetence (regurgitation) will result. The blood then becomes gradually dammed back in the large veins, as the right auricle has little or no power to counteract the backward pressure of the blood. The organs become

therefore engorged with venous blood, which tends to accumulate in them. Especially are the liver, spleen, stomach, and kidneys liable to suffer thus. Dropsy now tends to appear; at first slight and perhaps only noticeable as a puffiness around the ankles at the close of the day, it increases in quantity, and is an early sign of heart failure. In advanced cases not only may the legs be "water-logged," but the abdomen and chest may come to be full of fluid.

All these phenomena constitute the condition known as "backward pressure," arising from failure of the heart to overcome the hindrances which result from the valvular disease.

We see, then, how widespread may be the evils which follow on disease of the heart-valves. It must be understood, however, that it is only when the heart begins to fail that these troubles arise; and that while the organ is able to respond to the increased demands made upon it, so long, in fact, as "compensation" is established, the patient may lead a life of moderate comfort, and may live perhaps many years.

Symptoms. The symptoms of valvular disease of the heart are apt to be various, but we are accustomed to recognise four as being more especially associated with interference with the heart's action. These are palpitation, by which we mean a consciousness of the beating of the heart, which all of us have experienced at one time or another as a result of excitement, suspense, or other emotion; shortness of breath; pain; and syncope—that is to say, a sudden stoppage of the heart's action, which may be merely momentary or may be permanent, when death of course ensues.

We have said that these symptoms are associated with interference with the heart's action. We use the word "interference" because it does not necessarily imply "organic" disease. These four symptoms may, in fact, all be present in functional affections to which the heart is liable, just as we have seen the stomach to be.

To establish the diagnosis of valvular disease the doctor listens to the sounds of the heart at certain points on the chest-wall, and finds them altered in character according to the nature of the mischief and the valve or valves affected. The chief sign is what is known as a "murmur,"

a peculiar sound of variable character which accompanies or replaces the first or second sound of the heart, or both sounds when two murmurs are present. The murmurs are produced either by the reflux of blood through an incompetent valve or by the blood being driven through a narrowed orifice. Murmurs may also sometimes exist apart from any valvular disease, but with these we are not at present concerned.

Enough has been said to show that our chief evidence of valvular disease lies not so much in the symptoms complained of as on what is learnt from the examination of the heart. Our examination, in fact, requires to be not merely subjective, by which we ascertain the patient's feelings, but also objective; and this, indeed, applies to the detection of most of the diseases of the body.

If the nurse is told the form of valvular disease which is present, and which valve is affected, she will often, from the description given, be able to form a picture in her mind's eye of what is going on in the heart, and by the presence or absence of the phenomena of "backward pressure" she may be able to form an idea as to how the heart is coping with the increased work required of it.

The result of backward pressure on the various organs.

The result of backward pressure on the various organs may now be briefly summarised. It tells on the lungs by causing cough, possibly accompanied by the spitting of blood, and shortness of breath. There may be slight jaundice, as a result of impaired activity of the liver, brought about by its engorgement with venous blood. The stomach fails to completely discharge its digestive functions, and dyspepsia arises in consequence, with its attendant symptoms. There may be vomiting of blood. The kidneys fail to secrete the usual quantity of urine, which often contains albumin and sometimes tube-casts (see chapter xxv.), more rarely blood.

Such, briefly, are the symptoms of cardiac failure in addition to those caused by the dropsy, which, as we have seen, may affect the lower limbs, the abdomen, and the chest at one and the same time.

Management of valvular disease.

The management of valvular disease is a large subject, but we shall limit it by considering almost entirely those cases in which cardiac failure has supervened, for it is with such cases that the nurse will be brought into contact.

Our principal object is to seek to re-establish the compensation which has failed; for we cannot repair the damaged valve. We desire, therefore, to place the heart in as good a position as possible to overcome the difficulties which a diseased valve necessarily causes.

Rest. Rest is of the highest value, acting as it does by diminishing the amount of work required of the heart. The organ is thus more likely to recuperate, providing, of course, the disease is not too far advanced. In such a case rest then comes to be a necessity, for the patient will be unable to get about. As a general rule, however, slight exercise short of fatigue does good; but in this respect the doctor's orders must be rigidly enforced.

Drugs. Drugs. By far the most valuable drug we possess in cases of valvular disease and resulting heart failure is digitalis (the common foxglove).

Action of digitalis on the heart. Briefly, the action of this drug on the heart is twofold: the muscular substance is strengthened, and the heart's action is slowed. The heart therefore comes to beat more strongly, and consequently the blood is discharged more forcibly into the large arteries (pulmonary artery and aorta). By slowing the heart, the organ is, as it were, held in check, and a longer time is allowed for the blood, which has been returned to the left side of the heart from the lungs, to be efficiently emptied into the aorta. We see, then, that the irregularly and weakly beating heart is steadied and strengthened by this drug. In passing, it may be mentioned that digitalis also acts as a tonic to the arteries and increases the flow of urine, both of which actions are of great value in heart failure.

The other members of the group which we have referred to as "heart tonics" are often used in treating valvular disease, but they all hold a second place to digitalis. In some cases of valvular disease, especially when the aortic valve is affected, opium and morphia are of the greatest value to relieve pain and to procure rest and sleep. Often, however, the doctor prefers other drugs to opium to overcome the sleeplessness of heart disease. Among the drugs given for this purpose are paraldehyde, sulphonal, hyoscyamus, and less commonly bromide of potash.

Embarrassed breathing its relief. The breathing may cause the patient much anxiety; and in bad cases he may be unable to lie down. In such a

case a mixture containing carbonate of ammonia, ether, and perhaps squills (with morphia, when not contra-indicated), is prescribed with benefit. The patient must be propped up and made as comfortable as possible under the circumstances.

Spitting of blood will be referred to when considering the subject of Phthisis.

Management of dropsy. The management of dropsy depends on its severity. The doctor endeavours to get rid of the fluid, at any rate in part, by keeping the bowels freely opened, by increasing the amount of urine secreted, which is usually scanty, and by promoting the action of the skin. Fluid, when in large quantity, may require to be removed from the abdomen, the thorax, or the lower limbs: this generally has to be repeated, often at short intervals, as the fluid tends to reaccumulate quickly. To remove fluid from the chest or abdomen, an aspirator or trocar and cannula or other apparatus may be used (see Pleurisy, chapter xxiv.). The nurse must make herself familiar with the fitting together and working of the aspirator.

Removal of fluid from the abdomen. In cases of removal of fluid from the abdomen she should have in readiness a piece of flannel broad enough to reach from the nipples to the pubes and long enough to pass twice completely round the body. The two ends are torn into tails, and the middle of the bandage is applied to the abdomen. A hole is made in the middle of the bandage for the needle of the aspirator or the trocar, and as the fluid is evacuated pressure is kept up by pulling on the tails of the bandage from behind.

Removal of fluid from the lower limbs. For the removal of fluid from the lower limbs a set of fine tubes (Southey's tubes) are in general use. They require to be used with careful antiseptic precautions. One or more tubes are inserted into the leg, and to them are attached long pieces of thin rubber tubing, which are allowed to drain into a vessel containing a little carbolic lotion of known quantity. The legs are wrapped up in cotton-wool or gamgee-tissue, and, when possible, the patient sits in a chair with the limbs resting on a stool. The amount of fluid thus removed is measured and recorded. It is often considerable in amount. The tubes are kept in for a variable length of time, and, on removal, the punctures are sealed with a film of cotton-wool and collodion or friar's balsam.

Among other modes of treatment which are applicable in certain selected cases of valvular disease may be mentioned hot baths, massage, and the special course of treatment recommended and first practised by the brothers Schott on the Continent, and which has been used with advantage recently in our own country. This treatment, which is more especially adapted to certain cases of enlargement of the heart arising from dilatation, includes a course of medicated baths and a certain regulated and systematic set of movements.

Although our remarks on the management of valvular disease have so far referred almost entirely to the course generally pursued by the medical man, still we venture to think that the nurse will fulfil her duties more efficiently and more intelligently if she can appreciate in some measure the *rationale* of the management of these cases.

Actual nursing of heart cases. The actual nursing of heart cases calls for unremitting attention, and often for the exercise of much resource in avoiding all unnecessary fatigue and in making the patient comfortable. All excitement and everything which may be likely to worry the patient must be studiously avoided. Sometimes a special nurse will be required to devote her whole time to the case.

The diet. The diet will require to be carefully drawn up and adhered to. Usually an excess of liquid nourishment is contra-indicated. Nourishing articles of food in small bulk, such as the various meat-juices, jellies, and the like, are the most suitable.

Alcohol. We have not yet spoken of the use of alcohol in valvular disease. Regarding its systematic use throughout the course of the disease there is much difference of opinion; but its value is undoubted in dealing with urgent symptoms, especially the sudden onset of faintness and great feebleness of the pulse. In such a case the nurse may occasionally require to give brandy on her own responsibility, when medical aid is not immediately available. Sometimes brandy is given with advantage as an enema. The brandy-and-egg mixture is a favourite way of giving alcohol in bad heart cases. **Brandy-and-egg mixture.** It is made as follows:—Mix together equal parts of brandy and cinnamon water (four ounces of each), the yolks of two eggs, and half an ounce of sugar. Give one or sometimes two fluid ounces of the mixture for a dose.

There are a few remedies that the nurse should always have in readiness when she has a bad heart case—namely, nitrite of amyl capsules, a hypodermic syringe with strychnine solution, and ether, in addition to brandy. A cylinder of oxygen gas and a battery in good working order should also be at hand.

There are many points in the management of heart cases which we have been unable to touch upon, and which the nurse will best learn in her practical work. She will find that she will have something fresh to learn in every such case which she is called upon to minister to.

Management of valvular disease unaccompanied by heart failure.

It is not necessary to speak in detail about the management of valvular disease unaccompanied by any symptoms of heart failure, for cases such as these will not come into the nurse's hands. Such patients are given to understand that they must exercise care in their habit of life, if they wish to keep well. We have seen that valvular disease implies a greater demand on the heart; accordingly violent exercise, undue excitement, and what is generally known as fast living must be studiously avoided, and a regular healthy life led. Drugs are seldom necessary, but medical supervision is always advisable.

Bicycling.

Bicycling in great moderation is held by most medical men to be not only harmless but actually beneficial in such cases. No hill-climbing, racing, or long-distance riding should of course be attempted. A doctor's opinion should always be sought in every case.

Angina pectoris.

Angina pectoris, sometimes known as breast-pang, consists in a sharp agonising pain over the region of the heart, which generally occurs in valvular disease, but by no means always so. The pain tends to shoot up the neck and often down the left arm. There may be only one attack lasting a few minutes, or there may be a succession of attacks with a short interval between them. Consciousness is seldom lost. Angina pectoris is best regarded as a neuralgia of the heart, and, in the case of valvular disease, it may be brought on by undue excitement or exertion, errors of diet, and other conditions.

Remedies for angina dectoris.

Fortunately there is a class of drugs, of which the most commonly used are nitroglycerine and nitrite of amyl, which is of the greatest benefit in this disease. It is probable that angina pectoris is closely associated with a spasm, and

consequent narrowing of the calibre of the arteries, which acts as a hindrance to the circulation of the blood. These drugs increase the "bore" of the arteries by relaxing the muscular fibres contained in their walls. Hence the blood flows more readily as the spasm is overcome and the symptoms are, at any rate for the time being, relieved. Nitrite of amyl acts more quickly than nitroglycerine, and accordingly is the more valuable drug in this affection, where a rapid action is so necessary. It is customary to inhale a few drops of the drug sprinkled on a handkerchief, or, better, contained in a glass capsule, which is broken and held to the nose. The drug must be used cautiously, and of course only by the doctor's orders. Nitroglycerine is administered either in mixture or as tabloids.

The nurse will, during an attack, bare the chest. Mustard may be applied over the heart and hot bottles placed to the feet. It may be necessary for the doctor to inject morphia or to give chloroform (by inhalation) to procure relief. Nitrite of amyl capsules should, as we have already pointed out, always be kept at hand in all heart cases, as well as in angina pectoris. They should be kept in the poison-cupboard under lock and key.

Exophthalmic goitre. It will be convenient to include in our account of affections of the heart that of a disease which has for one of its prominent symptoms a disordered action of the heart, which gives rise to palpitation and a rapid pulse. The name given to the affection is exophthalmic goître, and this name tells us of the two other principal features of the disease—namely, a marked protrusion of the eyeballs (exophthalmos), and an enlargement of the thyroid gland (goître): these phenomena are by no means always all present in a given case. Exophthalmic goître is probably a disease of the nervous system. It is commoner among women, and is often brought on by a fright or great excitement.

Principal features.

Its management. The management of the disease includes a good diet, a quiet life, and a complete change with absence of all worry and excitement. The drugs most commonly prescribed are iron and arsenic, which improve the blood and act as general tonics, and digitalis, which, as we have seen, slows and strengthens the heart. The battery is sometimes used with benefit.

Diseases of the arteries. The arteries are liable to become inflamed (arteritis or

endarteritis). Acute arteritis is rare, the inflammation being generally of a chronic nature. Chronic arteritis is usually looked upon as one of the signs of commencing bodily decay; hence the expression, "A man's age is that of his arteries." The chief importance to us of arterial inflammation, or rather of degeneration—for that is really what it is—in which the affected vessels lose their natural elasticity and tend to become rigid, is in connection with the disease known as aneurism, by which we mean a more or less localised bulging in the course of an artery, due to the weakening and stretching of one or more of the three coats of which the artery is composed. When an artery becomes weakened at any given point in its course, the force of the blood-stream continually acting on this weakened spot causes the vessel to become gradually stretched (dilated) in this situation, and unless the pressure of the blood can be reduced the dilated part of the artery will continue to stretch, until it eventually bursts, with resulting hæmorrhage, which in the case of a large aneurism is usually fatal.

Aneurism.

Causation of aneurism.

The two factors which produce an aneurism may be said to be a weak spot in the artery and an increase in the force of the blood-current. Probably the first factor is at work in every aneurism. The conditions which supply these factors are numerous. Aneurism is, as we should expect, generally a disease of later life, because it is at this period that the arteries tend to lose their resiliency. Again, it is a much commoner disease in men than in women, especially among labourers and soldiers, because of the greater force of the blood-current arising from their hard work. Certain arteries from their situation are more liable to aneurism than are others; among these may be mentioned the popliteal artery and the aorta, especially its commencement—the arch of the aorta.

Symptoms.

The symptoms of an aneurism depend on its situation, size, and the condition of its interior. Pain is usually present at one time or another; it is due in part to the pressure of the blood in the aneurism, and in part to the pressure of the aneurism itself on the nerves in its vicinity. The pain in the former case is of a dull aching character; in the latter case it is neuralgic in type and may simulate angina pectoris. In addition to pain the symptoms and signs of a swelling are present in greater or less degree. This

swelling may be fluid or solid, according as the contents are fluid or more or less firmly clotted blood. The aneurism may sometimes be seen or felt to pulsate, keeping time with the heart's beat. It may sometimes, from its position—as, for example, when it affects the arch of the aorta—press on adjacent structures, and thus give rise to symptoms such as difficulty in swallowing, cough, and alteration or even loss of voice.

Management of aneurism. The first principles in our management of an aneurism are, as the nurse will understand from what has been already said, to lessen the quantity of the blood and to diminish the force of the blood-stream passing through the aneurism. This acts beneficially in two ways: (1) by removing the strain from the already stretched and weakened walls; (2) by affording an opportunity for the formation of firm blood-clot in the aneurism, which is nature's method of cure. To carry out these principles various measures are resorted to, according to the position of the aneurism. These measures may be classed as medical and surgical. The former are always used, and are combined with the latter according to circumstances.

Medical. I. Medical. These may be divided into three: (1) rest, (2) diet, and (3) drugs.

Rest. (1) Rest is always indicated. In large aneurisms it must be absolute, the patient being kept quiet in bed.

Diet. (2) We have alluded to the diet in aneurism in an earlier chapter (see chapter viii.) dealing with dietetics. As low a diet as the patient can live upon is prescribed, and the fluid element is especially curtailed, even to less than half a pint a day in some cases.

Drugs. (3) The most valuable drug in aneurism is iodide of potassium. It is commenced in moderate doses, and is gradually increased until the patient comes to show evidence of intolerance by the appearance of a rash on his body, or by other symptoms, such as headache, running at the eyes, sneezing, etc., when the drug may have to be stopped for the time being or given in less quantity. **Symptoms of intolerance to iodide of potassium.**

Surgical means. II. Surgical. These measures are resorted to when medical treatment either fails or proves insufficient, providing, of course, that the position of the aneurism allows of their employment. Of the various procedures we shall only refer to two—namely, (1) pressure, either with the

finger (digital) or by means of a tourniquet applied to the artery at a distance, between the aneurism and the heart, and (2) ligature of the artery on one or other side of the aneurism.

Pressure.

(1) Pressure. For the application of pressure by the fingers relays of assistants are required, who take from five to ten minutes each in turn. This method is seldom feasible, as it may require to be continued for two days or even longer. Tourniquets are more often used. Unless carefully applied they are apt to irritate the skin. During their use, which is generally limited to forty-eight hours at a time, the patient requires to be under constant supervision, so that no bad effects, such as gangrene, may ensue. Whether we make use of pressure, ligature, or other surgical means to cure an aneurism, our object is always the same—namely, not to arrest the blood-current through the aneurism completely, but to render it so slow that clotting may gradually and not suddenly occur.

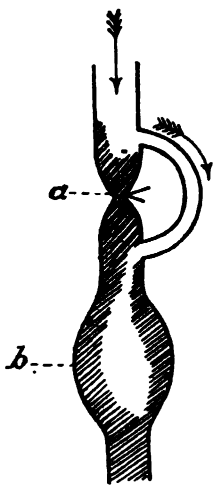


FIG. 70.

Diagram to illustrate the condition of an aneurism shortly after the ligature of the artery on the proximal (heart) side.
a. Ligature.
b. Aneurism.

(2) We have already described the operation of ligature of the femoral artery for the cure of popliteal aneurism, to which the nurse is referred (see page 189).

Changes which occur in an aneurism after ligature of the artery above it.

The diagram of an aneurism after ligature of the artery will explain itself (fig. 70). We see the spot where the ligature has been applied, and above this spot a small branch coming off from the main artery, which carries a small stream of blood into the aneurism. The blood-stream is thus not entirely arrested. The aneurism is represented with its walls covered with blood-clot, which will in course of time, if all goes well, come to entirely fill its cavity, when the aneurism will shrivel up entirely or almost so, as will

also the artery leading out of it. The blood has to make its way through other channels after ligature of the main artery, and our efforts are directed to promoting by warmth and other measures the circulation in the part of the limb below the aneurism.

Rupture of an aneurism. Rupture of a large aneurism occasionally occurs, nearly always with a fatal result. Indeed, if the patient live long enough and the aneurism increase in size, this is the inevitable result, provided of course that surgical measures cannot give relief. Rupture may occur externally, when the skin over the aneurism gives way, or internally into one of the hollow organs or cavities of the body. Little can be done in such a case. In such a case as rupture of an aortic aneurism death will probably be almost instantaneous. When possible, however, the artery between the aneurism and the heart should be firmly compressed with thumb or finger until other measures are forthcoming.

Phlebitis. Inflammation of a vein may be simple (phlebitis), or it may be associated with suppuration (suppurative phlebitis), when the disease is a serious one. Phlebitis is often caused by injury to the walls of a vein—as may occur, for example, during the course of an operation. The more severe variety of the disease generally arises from infection being carried to the vein from an abscess or a septic wound in its vicinity. **Thrombosis.** The blood clots in the vein, when thrombosis is said to occur, the clot of blood being spoken of as a thrombus. The vein becomes cord-like and swollen. The skin over its course becomes tender and sometimes red, and the limb generally swells. There may be severe pain, and often also a rise of temperature. In suppurative phlebitis there may be all the symptoms of blood-poisoning—pyæmia (see chapter xiii.).

Management of phlebitis. The patient must be kept at absolute rest in bed, with the limb elevated and carefully fixed on a back-splint. Poultices may sometimes be applied over the course of the vein to ease the pain, or hot lead-and-opium lotion. Sometimes glycerine and belladonna lightly painted over the inflamed area answers better. The nurse must realise the importance of prolonged rest in bed in these cases, in order to prevent any fragments of clot (thrombus) from being detached and carried in the blood-stream to various parts, which would produce serious results, especially if such

fragments contained germs that might infect other parts of the body (see Pyæmia, p. 127). Therefore she should use the utmost gentleness in moving or making any application to the limb. When the patient is allowed to get up, he must wear a domett bandage, and move about very cautiously for a month or longer.

We have been referring more especially to simple phlebitis. The suppurative variety is often a fatal disease; and its management, in addition to what has been already said, will include that of blood-poisoning. Amputation may even be necessary to save life.

We see, then, that even the mildest case of phlebitis must be looked upon as a serious disease, on account of the associated thrombosis.

Varicose veins. Veins which are irregularly enlarged are spoken of as varicose. Certain veins in the body, from their position, are specially liable to become varicose, such as those of the rectum (which give rise to the affection known as hæmorrhoids, or popularly as piles, which we have mentioned elsewhere), and those of the lower limbs. Our remarks will refer to varicose veins in the latter situation. It will be seen that the veins have to support, as it were, a column of blood, since the blood-stream in the veins is directed upwards towards the heart. Any condition, then, which impedes the return of blood, such as pressure on the veins above (in this case on the pelvic veins or on those of the thigh), or which tends to weaken the walls of the veins, will cause an enlargement of the vessel, especially at those points where the wall offers the least resistance. Not only do the veins become stretched from side to side, but they also become twisted and lengthened. The skin over the varicose veins is apt to become irritated, and may give way, when a varicose ulcer results. Occasionally the veins themselves burst, with consequent venous hæmorrhage.

Symptoms. The chief symptoms are a feeling of fatigue after standing a short time, and sometimes pain and swelling of the limb, which may feel cold and numb.

Management. The management is directed towards assisting the return of venous blood from the limb, and removing any source of pressure, when such is the cause of the affection. In bad cases confinement to bed may be necessary, and some-

times an operation may be required for their relief or removal.

Generally some form of support is enough, such as an elastic stocking (see chapter xx.), rubber or flannel bandage. The general health may be impaired, and the bowels are often constipated, both of which conditions will require attention.

CHAPTER XXIV.

DISEASES OF THE RESPIRATORY ORGANS.

WE shall limit our description of the diseases of the respiratory organs by confining ourselves almost entirely to those affections which the nurse will commonly meet with. These are four—namely, bronchitis, pneumonia, pleurisy, and phthisis.

Summary of the anatomy of the parts under consideration. Before considering the first of these, bronchitis, it will be well to refer once more briefly to the bronchial tubes, which have been already described in a previous chapter (see chapter iv.). The nurse will remember that the trachea divides into the two bronchi, right and left, which enter the right and left lung respectively, taking part together with the pulmonary arteries and veins in the formation of its root. Having entered the lungs, the bronchi divide into smaller tubes: these again divide and subdivide into still smaller tubes (bronchioles), which eventually end in the air-cells (alveoli). This brief summary of the anatomy of the parts under consideration will enable the nurse to understand that inflammation may affect the larger tubes or the smaller tubes (capillary bronchitis), and that inflammation of the bronchioles may readily spread to the air-cells when the bronchitis becomes associated with pneumonia (broncho-pneumonia), a disease most commonly met with in children. Again, bronchitis may be acute or chronic, the latter form of the disease often resulting from the acute variety.

Causes of bronchitis. The causes of bronchitis are many. It is a common disease in our own country, frequently arising from exposure to cold and wet, especially in the very young and in the aged.

Acute bronchitis. In acute inflammation the interior of the tubes becomes swollen, and there is soon poured out a sticky fluid, at first scanty, but gradually increasing in quantity.

The symptoms of acute bronchitis depend very much on the size of the tubes affected. The smaller the tubes involved, the more serious is, as a rule, the disease. There may be, and in at all severe cases usually is, a rise of temperature. Pain is often complained of on coughing; it is generally referred to the back of the breast-bone. Difficulty in breathing (dyspnœa) may be absent, or when present may be only slight or very marked, according to the extent of the disease. The cough has at first a tickling character, and until the expectoration (sputum) becomes more copious it does not seem to afford any relief. It is commonly spoken of as "hard and dry." The secretion in the tubes gives rise to various sounds, which may easily in some cases be heard by the unaided ear, or which may be only audible by means of the stethoscope. Some, at any rate, of these sounds are due to the air passing to and fro through the fluid in the tubes. When the smaller tubes (bronchioles) become affected, the nurse will generally notice, in addition to the symptoms already enumerated, those which are due to more or less interference with the aeration of the blood—namely, great dyspnœa, which may be so urgent as to prevent the patient from lying down, and blueness of the face. Symptoms such as these are always serious. The nurse must remember the liability of acute bronchitis to develop into broncho-pneumonia, especially in children enfeebled by measles, whooping-cough, and other fevers. **Symptoms.**

Chronic bronchitis occurs very often after middle life, commonly taking the form of a winter cough. There are apt to be frequent attacks of coughing, and large quantities of phlegm may be brought up, especially in the morning. There is no fever, nor is dyspnœa, as a rule, a marked symptom. **Chronic bronchitis.**

The complications of bronchitis, acute and chronic, are numerous. In addition to broncho-pneumonia may be mentioned heart disease and asthma, by which is meant a spasmodic affection of the bronchial tubes. **Complications of bronchitis.**

The management of the disease may be considered under three heads: (1) surroundings, (2) drugs, and (3) diet. **Management of bronchitis.**

(1) Surroundings. In acute bronchitis the patient must be kept in bed and the temperature of the room regulated. It should not be allowed to fall below 65° F., and may **(1) Surroundings.**

sometimes require to be higher. A moist atmosphere is generally most grateful to the patient. This may be obtained by the bronchitis-kettle, which is kept going near the patient. There may be added to the water a little friar's balsam (one teaspoonful to a pint of water), eucalyptus, ro other soothing remedy; but generally the water alone is quite sufficient. The fire must not be allowed to get low, and the spout of the kettle must not be directed immediately in front of the patient's face, but rather to one side, so that the air in his immediate neighbourhood is saturated with the steam. All draughts must be carefully prevented. Dust, too, is to be avoided, and for this reason no sweeping or dusting should be undertaken in the sick-room. In regard to chronic bronchitis the surroundings refer more especially to the outside air—the climate. Various watering-places and health-resorts are recommended, the chief points in the selection of a climate in these cases being mildness, absence of strong winds and dampness, especially during the winter months.

(2) Drugs. (2) Drugs. There are a large number of drugs in use in bronchitis. They include that large class of remedies known as "expectorants," which act by facilitating the removal of phlegm from the bronchial tubes. Among our most valuable expectorant drugs are carbonate of ammonia, iodide of potash, squills, paregoric, and ipecacuanha. One or more of these drugs is usually prescribed, and gives much relief to the cough. Opium may be required: it is usually given in the form of morphia, which is added to the mixture, and is often of great value when the cough is troublesome and prevents sleeps. Inhalations and lozenges are also used to relieve the symptoms. Applications to the chest include poultices and stimulating liniments. The former are of much benefit early in an acute attack, and are best made of mustard and linseed. They may be in the form of a "jacket" poultice. They require to be applied with care, and are best avoided in feeble children, where there is a tendency to the spread of the disease to the air-cells (broncho-pneumonia), as they are apt to increase the already difficult breathing. In such cases a cotton-wool or gamgee jacket answers better, being light and at the same time warm and comfortable. Children should not be allowed to lie too long in one position, as the

phlegm is apt thereby to accumulate in the tubes. They should be encouraged to cough up and not to swallow the phlegm. Among the liniments in common use in chronic bronchitis are the belladonna and that known as the compound camphor liniment.

(3) Diet. The diet in acute bronchitis requires to be nourishing, as the disease is often a serious one, and the strength must be maintained to the full. Beef-tea and the various broths, milk and eggs, will form the chief articles of food in the early stages. They should be given warm. Alcohol is often required, and is almost always prescribed at the extremes of life and where there is serious heart mischief. Brandy, which may be given as the brandy-and-egg mixture, is the most suitable stimulant. In chronic bronchitis the diet need not be restricted, unless other conditions, such as heart disease and gout, are present. The diet should, however, be light and easily digested. Alcohol may or may not be needed, according to the severity of the symptoms and the presence or absence of complications. **(3) Diet.**

Inflammation of the lungs, commonly known as pneumonia, is a disease which in our changeable climate is very common. The nurse will probably frequently meet with this disease, and therefore it merits a somewhat detailed description. Although the actual disease is situated in the lung, yet this can only be regarded as part of the malady, and we must look upon pneumonia as a disease more or less closely allied to the affections we have considered in a previous chapter (see chapter xxi.) under the head of the specific fevers. **Inflammation of the lungs: pneumonia.**

The disease only under exceptional circumstances becomes in the ordinary sense of the word "infectious"; but we now know that there are certain germs which have been found to produce the disease; and if they cannot in every case be said to be the cause of pneumonia, yet probably in most cases they are responsible for its occurrence. The conditions which either cause pneumonia or which render the individual liable to be attacked by it are exposure to cold and wet, insufficient and bad food, overcrowding and insanitary arrangements, and in fact everything which debilitates and impoverishes the body. It is specially, however, the first of these, namely exposure to cold and wet, which accounts for so many attacks of the disease. **Causes of pneumonia.**

Changes which occur in the lung in pneumonia.

The changes which occur in the lung during the course of the disease must now occupy us. The capillaries of the air-cells become swollen and engorged with blood, and some of the corpuscles escape into the air-cells. This is the stage of congestion of the lung, which lasts for about thirty-six hours. The air is not yet entirely prevented from entering the inflamed area; so that, were we to place a portion of the congested lung in water, it would still float, as it does in the healthy state. In the next stage the blood-elements which have commenced to escape into the air-cells become solidified. The air is now prevented from entering, the lung loses its elastic qualities, and becomes more or less solid, like the liver.

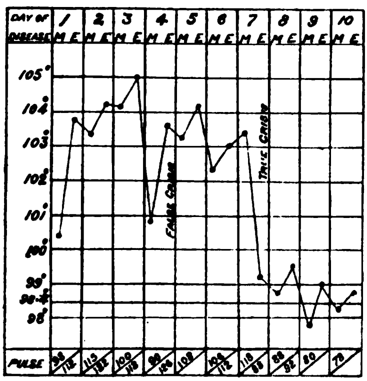


FIG. 71.—CHART FROM A TYPICAL CASE OF PNEUMONIA, SHOWING FALSE AND TRUE CRISES.

This continues for a few days, when the material, in a favourable case, begins to again become more liquid, and is gradually absorbed; at the same time the circulation of the blood in the walls of the air-cells becomes restored, and the lung begins to resume its work of aerating the blood. In an unfavourable case the inflammation may continue and go on to abscess formation or even gangrene, as we have seen may occur in other parts of the body.

Extent of the disease.

Pneumonia may affect one lung (single), or more rarely both lungs (double). The part of the lung by far the most commonly affected is the lower lobe. When the top of the lung is affected (apical pneumonia), the disease is always more severe.

Symptoms and signs.

The symptoms of pneumonia are usually very characteristic. They include those of severe fever, which we have already described, and those which are referable to the actual disease in the lung. An attack of pneumonia usually

commences with a severe shivering fit, which is accompanied by a marked rise of temperature, as shown in the chart (fig. 71), which represents the course of a moderately severe case. There is generally a pain in the affected side of the chest. Together with the rise of temperature there is an increase in the pulse-rate and also in the respirations, which may go up to thirty or forty in the minute, or even still higher. The nurse will notice a flush on the cheeks, and often also some vesicles (herpes) round the nostril and on the upper lip. There is a short troublesome cough and more or less dyspnœa, depending on the extent of the disease; the less amount of lung tissue which is capable of aerating the blood, the more marked will be the interference with the breathing. The expectoration is scanty, viscid, and generally streaked with blood, which gives it the well-known rusty appearance. These symptoms continue in greater or less degree throughout the disease. About the fourth day the temperature may drop (false crisis), but only to rise again until the sixth or seventh day, when it suddenly falls (true crisis), usually later in the day, and seldom rises again to any extent. The crisis is sometimes, however, ill defined.

Signs of pneumonia. The signs of pneumonia as elicited by an examination of the lungs hardly require mention, as these can only be appreciated by the medical man. Suffice it to say, that the inflamed lung gives a dull instead of a resonant note on percussion, because it contains no air; and the breathing is heard, on listening to the lung with the stethoscope, to be more distinct and otherwise altered in character, because the "solid" lung conducts the breath-sounds better than does the aerated lung. The nurse should study carefully every case of pneumonia which she meets with, because there are so many types of the disease, depending on the constitution, the age, the site, and the extent of the inflammation and the complications which may supervene. She should note the character of the pulse as well as its frequency, for this the doctor is wont to regard as the most important sign in estimating the gravity of the disease.

Other symptoms of fever, such as a furred tongue, constipation, and scanty high-coloured urine, are present, and may in severe cases be accompanied by delirium, which is not at all uncommon, especially in intemperate subjects,

who usually have the disease severely. In a bad case all the symptoms which characterise the typhoid state may be well marked, and will always give rise to anxiety. Young children and the aged bear pneumonia badly, and the disease is always more serious in the weak and debilitated.

Complications of pneumonia. The complications of pneumonia include abscess and gangrene of the lung (to which we have already alluded), severe pleurisy (slight pleurisy is probably always present), heart failure, bronchitis, and jaundice.

We have gone into some detail in describing pneumonia because so much depends on skilled and intelligent nursing; and we believe that the nurse will be able to do more for her patient if she is acquainted with the more important features of the disease.

Management of pneumonia. The management of pneumonia resolves itself into that of the specific fevers generally, and also into that of the inflammation of the lung, the local evidence of the malady.

We have no cure for pneumonia; the disease must run its course, and our object is to conduct the patient safely through his attack. Provided no complications arise, the part of the nurse is often the more important one: not that she is to replace the doctor, for every case requires the strictest medical supervision, but she can generally do more for her patient. In other words, the patient requires to be nursed rather than "treated." One of the most important principles to be observed is to support and husband the strength in every possible way. The patient must be kept absolutely at rest in bed, and the rest must be mental as well as physical. It is only occasionally that the doctor treats his patients with depressing remedies, because it is only seldom that such measures can be stood.

The room. The room should be well ventilated, and the temperature maintained at about 63° F. as a general rule, although in special cases it may require to be raised.

Local applications. There is some difference of opinion regarding the question of local applications to the chest. The use of cold, either

Cold. as cold sponging, cold compresses, or the ice-bag, has its advocates; but it is held that the time for the use of cold is only in the early stages, and then only in those whose constitution will stand it. Its use in the aged and in those

who are weakened either by previous disease, intemperance, or poor living is always to be avoided. Probably the chief value of cold is in those exceptional cases where the temperature rises to 106° or higher (hyperpyrexia), when it must be lowered with as little delay as possible. In such a case the cold-pack, tepid or cold sponging, or sometimes an ice-bag or iced cloths applied to the body, give good results. During their use, however, the state of the pulse requires to be constantly observed, and a weakening of its force or a tendency to collapse on the part of the patient will call for their immediate withdrawal.

Most medical men agree in preferring hot applications to the chest, such as poultices and fomentations, but these require to be used with great care, to prevent any additional chill. Jacket poultices should be light, so as not to interfere with the breathing. Such remedies are of much value in relieving the cough and the pain in the side, which are often so troublesome. Except, however, when these symptoms trouble the patient, it is best to rely on a cotton-wool or gamgee jacket, which is made to completely envelop the chest. It is a good plan to divide the nightdress down the back, and to attach tapes to each side for tying. This renders access to the chest more easy, and lessens the movement of the patient. **Heat.**

The question of drugs is of course one which concerns only the medical man; it may be said, however, that they are only used to relieve symptoms. We have seen that a high temperature, pain, and cough may be relieved by local measures, but these are not always sufficient. In the early stages quinine is often given to reduce the fever, calomel or other aperient to freely open the bowels, and a mixture to promote the free action of the skin and kidneys. When the cough is troublesome a "linctus" is often ordered, which may contain ipecacuanha, squills, or other expectorant drug, and often also a little morphia, which not only helps to relieve the cough, but may also dull the pain and procure sleep. In cases of sleeplessness, however, when the doctor gives morphia, he generally prefers to inject it under the skin, so that a more rapid action may be procured. To promote sleep, other drugs, such as those we have mentioned in the last chapter, are often ordered. We desire, however, to avoid the use of drugs as much as possible, **Drugs.**

and try to procure sleep by such simple measures as tepid sponging, quietness, and darkening the room, which are very often quite sufficient.

Heart failure. The most serious symptom which may arise in a case of pneumonia, and one which is so commonly met with in the aged and in those of feeble constitution, is heart failure, which we have already mentioned under the head of complications. This may give rise to much anxiety and danger, and therefore both doctor and nurse must use every endeavour to prevent it and to counteract it when it is threatened. We have already insisted on the importance of maintaining and husbanding the strength. Signs of commencing heart failure will be evidenced to the nurse by an increased rate of the pulse, accompanied by a loss of force and an irregularity in its beat, by coldness of the limbs, and by an increase in the respirations, together with marked dyspnœa. The face, and perhaps also the fingers and toes, will become of a dusky blue colour when the failure of the heart becomes more pronounced. In cases such as these our sheet-anchor is alcohol, and usually we administer it in the form of brandy. When heart failure is merely threatened, the medical man may merely order a little wine to be added to the diet, and this will often prove quite sufficient; but, as we have said, brandy is the stimulant which is always indicated when heart failure is actually present. We may require to give as much as twelve ounces in the twenty-four hours. Usually from three to six ounces is the necessary quantity. Other remedies for heart failure, all of which, however, occupy a second place to alcohol, include digitalis, ammonia, and strychnine. Probably alcohol is not needed in every case of pneumonia, but the doctor seldom fails to order it when the pulse is over 120, and always when the heart shows signs of giving way. The nurse, then, must constantly be on the look-out for a threatened failure of the heart, so that she may report to the doctor and no time may be lost in coping with it.

Delirium. Delirium may be slight and call for no treatment; or, on the other hand, it may be well marked (active), when the symptom is always a serious one. In such a case a good nurse can do much to soothe her patient by tepid sponging and a warm drink of milk, to which brandy may be added, with the doctor's approval, in suitable quantity, according to

the age and other considerations. No force must be used in restraining the patient's movements unless he attempt to do himself harm, and even then he must be controlled with the utmost gentleness. Tying the limbs or any other such procedure must not be thought of. Only in extreme cases does the doctor resort to an opiate, and then morphia, injected hypodermically, answers best.

Embarrassed breathing. Apart from failure of the heart, the breathing may become extremely embarrassed, and give rise to much alarm; especially is this liable to occur when the pneumonia is "double." Of late years the inhalation of oxygen gas has been prescribed in such cases, sometimes with benefit. It acts by aerating the blood, which the lungs are unable sufficiently to accomplish; but it must be borne in mind that respiration consists not merely in the admission of oxygen into the lungs, but also in the giving off of carbonic acid gas, and therefore the inhalation of oxygen cannot be looked on as a true supplement to respiration. A mixture containing ammonia and ether is often administered to overcome the dyspnœa.

Diet. We now turn to the consideration of the diet. It is obvious that this must be as nutritious as possible, in order to support the strength. Until the crisis liquids must be adhered to almost exclusively. Milk, strong beef-tea, chicken-broth, custards, eggs, and milk-puddings will be largely depended on. Where possible articles such as ox-tail soup, calves'-foot jelly, and oysters may be given as a change. Cooling drinks are refreshing, and promote the action of the skin and kidneys. Home-made lemonade is the most suitable. The nurse must avoid over-loading the stomach, and food need not usually be given oftener than every two hours or hour and a half. A large quantity of fluid may merely embarrass the breathing by filling the stomach and causing pressure on the diaphragm.

Convalescence. Little need be said about convalescence. The nurse must remember that the crisis of pneumonia is an anxious period, as it is the turning-point of the disease. With the fall of the temperature there is apt to be some prostration, which will be met by the administration of alcohol. This may require to be continued for some days after the crisis. Convalescence is usually rapid, and is promoted by tonics, a generous diet, and change of air.

Inflammation of the pleura.

Pleurisy.

Inflammation of the pleura, the membrane which covers the lung and also lines the wall of the chest on each side, occurs under a variety of conditions. To this disease the name pleurisy is given. For the understanding of the disease it must be remembered that the pleural membrane on each side of the chest forms as it were a closed sac, the surfaces of which are apposed in health, gliding over each other with every movement of the chest in respiration; but under certain circumstances they become separated by the presence of air or fluid in the cavity. The pleura is, then, a potential cavity, and in this respect corresponds with the peritoneum and pericardium. There is, however, in all these sacs a small quantity of fluid in health, which acts as a lubricant to their surfaces, and permits of them gliding freely the one over the other.

Varieties of pleurisy.

Pleurisy may be "dry," when no fluid is poured out; or it may be associated with the presence of more or less fluid in the sac (effusive pleurisy). This fluid may be like the fluid of the blood (serous), or it may be purulent, when the disease is known as empyema or suppurative pleurisy.

Causes.

Pleurisy is generally caused by exposure to cold, but it may arise as a complication in various diseases, such as pneumonia and rheumatic fever; it may also occur in the course of some of the specific fevers, such as typhoid and small-pox, when it is very often of the suppurative type (empyema).

Changes in the pleura when it becomes inflamed.

The changes which take place in the pleura when it becomes inflamed need not detain us long. Suffice it to say that the smooth, glistening surfaces become dull, and then covered with a sticky material (lymph), which causes them to adhere together more or less firmly, instead of gliding over each other as in health. If fluid be poured out the surfaces become separated, to be again brought into contact with the removal of the fluid, either by natural or artificial means.

Symptoms.

The early symptoms of pleurisy are a feeling of chilliness, sometimes amounting to actual shivering, and a sharp pain, often of a stabbing character, in the affected side. This pain is made worse by movements of the chest-wall, and consequently the breathing is what is commonly termed "shallow" or "suppressed." The patient is afraid to fully expand his chest. Combined with these symptoms there is a rise of temperature, but never of so decided a character

as in the early stages of pneumonia. The pulse is increased in frequency, as are also the respirations, and there is often a short dry cough. The attack varies in its severity, but the patient is never so ill as in pneumonia, and oftentimes the disease is rather painful than actually serious. The rubbing of the inflamed surfaces of the pleura against each other gives rise to a peculiar sound (friction), which we have already alluded to when describing pericarditis. This sound is usually easily heard by the doctor on applying his stethoscope to the inflamed area, and may sometimes be so "coarse" as to give rise to a vibration, which can be felt on applying the hand to the spot. When fluid comes to be poured out, as it usually is in greater or less quantity, the friction and the pain, which are both due to the same cause, now disappear, because the surfaces become separated by the fluid; consequently the breathing becomes easier than before, but only up to a certain point, because as the effusion becomes more copious the lung is pressed upon and its function becomes interfered with. This leads to embarrassed breathing of mechanical origin.

Signs of fluid in the pleural cavity.

The nurse will observe that when the fluid becomes large in amount the affected side of the chest is altered in shape. The depressions between the ribs become effaced, and there may be an actual bulging of the chest-wall in these areas. The lung, which at first floats in the fluid, is ultimately pressed against the spine, and the heart is pushed over to the sound side, as is shown by a change in the position of the apex-beat. All these signs of pressure will be intensified as the fluid increases in amount. The effusion of fluid causes the breath-sounds to be heard less distinctly than normally by the stethoscope, and they may be even entirely absent. The sound elicited by the doctor on percussing the chest is no longer resonant, as it is on the sound side, but quite dull, possessing little or no tone. This is due to the fluid which lies between the chest-wall and the lung. The fever in a simple case of pleurisy only lasts a few days, and the symptoms gradually disappear, and convalescence is established. The fluid, if not excessive in amount, gradually becomes absorbed, and the lung at the same time expands from above downwards. Absorption may at first be rapid, but it is generally a slow process.

Empyema.

A few words must now be said about suppurative pleurisy,

or empyema. This is a far graver malady than simple pleurisy. The symptoms correspond very much with those which characterise a simple pleurisy with effusion, but there are certain additional features in such a case. Firstly, the patient is more seriously ill; he is more anxious and depressed. There is hectic fever, which is marked by chills, sweating, and the hectic type of temperature, namely a rise in the afternoon and a fall in the morning.

The question will often arise in the case of pleurisy with effusion, Is the effusion serous or is it purulent? This may be hard to determine when hectic fever and its accompanying rigors are absent or ill marked, and often it can only be settled by introducing a grooved needle or fine trocar into the pleural cavity, and drawing off a small quantity of the fluid for examination.

Management of pleurisy.

The management of a case of pleurisy will depend considerably on the variety with which we have to deal. In a simple case of moderate severity, such as we shall speak of in the first place, little may be required. The patient will of course be confined to bed even in mild cases. Local rather than general measures are employed to give relief. These will include poultices, blisters, liniments, and occasionally leeches to the affected spot, all of which tend to relieve pain and act beneficially on the inflammatory process. The affected side is also sometimes strapped with advantage to lessen its movements. Drugs will be used internally as required, to act on the bowels, the skin, and the kidneys, to procure sleep, to check the cough, to relieve the pain, to lower a high temperature, and later to promote the absorption of fluid. Nothing special about the diet requires mention; it will be that of a moderately febrile disease. Some believe that a dry diet is most suitable, as tending to limit the effusion of fluid. Stimulants are not usually required.

Removal of fluid from the chest.

It may be necessary to remove fluid from the chest in cases where a large quantity has accumulated, owing to the serious pressure symptoms to which it may be giving rise. As a general rule a large accumulation of fluid at the end of a fortnight, which shows no signs of becoming absorbed, demands removal. We shall briefly describe the procedure as carried out by the trocar and cannula or the aspirator. The patient lies near the edge of the bed on his back, but inclining towards the affected side. The nurse must

have in readiness a little salt and a small lump of ice with a smooth surface, or else a spray of chloride of ethyl or anestile, to produce local anæsthesia; carbolic lotion (1-40), a small scalpel, a trocar and cannula (when this method is employed), with about four feet of rubber tubing in connection therewith, which falls into a basin containing a little water; also lint and gauze, collodion and strips of strapping. It is best to have the tubing interrupted by a piece of glass tubing, so that the character of the fluid passing and also the rate of flow may be observed. The chest is usually punctured at the side rather than at the back, as this disturbs the patient less. The exact spot is selected by the doctor, and the skin is frozen by means of the spray or the ice and salt. After drying the skin a small incision is made, and the trocar is plunged into the pleural cavity. Before this is done the cannula must of course be connected with the tubing, which drops into the basin under the bed. On withdrawing the trocar the fluid flows out through the cannula and tubing into the basin. When sufficient has been removed, the cannula is removed, and the wound is covered with gauze, and collodion is painted over it. Strips of strapping, which should overlap each other, are now tightly fixed round the chest, from the breast-bone in front to the spine behind, or, better still, a little beyond these points, encroaching somewhat on the sound side.

Aspirator. Many doctors prefer to use the aspirator to the trocar and cannula; in this case the fluid is withdrawn into a bottle which has been previously exhausted of air by a syringe. Two points must be insisted on in removing fluid from the chest, and it is necessary that the nurse who assists in the procedure should bear them in mind. (1) All the apparatus must be absolutely clean: the points of needles or trocars must be dipped in carbolic lotion, or, after having been smeared over with oil to prevent tarnishing, must be quickly passed through the flame of a spirit-lamp twice. (2) On no account must any air be admitted into the pleural cavity. This is prevented, in the case of the trocar and cannula, by the india-rubber tubing connected with it having its other end kept under water in the basin, and in the case of the aspirator by a series of taps, which the nurse will under-

stand the working of by examining and fitting together the instrument at her leisure.

Management of empyema. Doctors are almost entirely agreed that the presence of pus in the pleural cavity, even in small quantity, calls for removal with as little delay as possible, because an effusion of pus is, in itself, poisonous. The operations performed for the relief or cure of empyemata have been already described (see chapter xix.). Our object in such a case as this differs from that which we had in view in removing serous fluid, for here we are not content merely to remove a portion of the effusion, leaving the remainder to become absorbed, but we aim at its entire removal and at thorough drainage of the pleural cavity, so as to prevent its reaccumulation. A liberal and nourishing diet is necessary in cases of empyema, and a little wine is generally added to the dietary by the doctor. These cases are generally long and tedious, and will require much attention in the way of dressing. Especially in dealing with empyemata must the nurse be careful to use antiseptics. The discharge and the soiled dressings should be perfectly sweet. The great object we have in view, in addition to preventing septic changes taking place in the pleural cavity, is to promote the expansion of the compressed lung. This we cannot always hope for, especially when the pus has been large in amount and the case of long standing, but it may be looked for in recent cases. Change of air and tonics are of importance in hastening the protracted convalescence. In such cases cod-liver oil or one of the various preparations containing it is generally prescribed with advantage.

Pneumothorax. The nurse may meet with a disease to which the name pneumothorax is given, a term which signifies the presence of air in the pleural cavity. We have said that the pleura is normally a closed cavity with its surfaces in contact; therefore in health it contains no air, and it can only come to do so when a communication exists between the lung and the pleura which covers it, or between the pleura and the external air. This, if not absolutely true, may be regarded as practically so.

Origin. Pneumothorax most commonly occurs in the course of phthisis, from the breaking down of a cavity in the lung. It can easily be understood, however, that it may also occur from the bursting of an empyema through the pleura into

the lung, when the pus will be discharged by the air-passages, and air will enter the pleural cavity through the resulting opening. This cause is, however, less common than the first mentioned.

Symptoms. The chief symptoms of a suddenly developed pneumothorax—as may occur, for example, in an advanced case of phthisis—are great dyspnœa, pain in the side, and shock. The pulse and respirations are rapid, and the skin is covered with a clammy perspiration. The patient may complain of something having given way on the affected side. The nurse will notice the anxious countenance which is so characteristic of severe dyspnœa. Pneumothorax is always a serious disease, and is very often fatal, sometimes rapidly so, occurring, as it so often does, towards the end of an exhausting illness.

Management of pneumothorax. The management of the disease consists in supporting the strength and relieving the dyspnœa, the shock, and the pain. Stimulants and opium or morphia are always required. Hot bottles should be applied to the feet. The affected side is often firmly strapped to control the respiratory movements. The medical man sometimes inserts a fine trocar into the pleural cavity to remove the air and the fluid which usually accompanies it, with the object of relieving the embarrassed breathing. It may be necessary to administer chloroform by inhalation to give relief.

Phthisis, or consumption. The last of the diseases of the respiratory organs with which we have to deal is perhaps the most important of all, and one which every nurse will encounter at one period or another of her training. We refer to phthisis, commonly known as consumption. The term phthisis means a wasting, and this is an important and well-marked feature of the disease.

Significance of term "tuberculosis." We are at present only concerned with the lungs, but it must be clearly understood that other tissues and organs are exposed to the same disease as the one we are about to describe. To the phenomena which constitute the disease, irrespective of its situation, the name tuberculosis is applied. Hence we may not only have to deal with tuberculosis of the lungs, but we may meet with the same disease in the brain, the bowel, the peritoneum, the kidney, the joints and bones, and in other situations—the affection being more or less modified according to the part of the body which it attacks.

Finally, the disease may be generalised throughout almost the entire body (general tuberculosis).

Cause of tuberculosis. We must next enquire what is the cause of tuberculosis, and our remarks will refer more especially to phthisis. The causes are best regarded as, firstly, those which predispose to or favour the disease; and, secondly, the actual agent which is responsible for the affection. Under the heading of predisposing causes come heredity, age, constitution, injury or disease of a tissue or organ, unhealthy surroundings, and insufficient and bad food. Supposing that more than one of these factors are at work, as is so commonly the case, then the likelihood of the body being attacked by the disease is of course all the greater.

Heredity. It has been abundantly proved that the tendency to tuberculosis (not, be it noted, the disease itself) is hereditary, and this hereditary tendency may be strong or weak, according as both the parents have been affected or only a distant relative.

Age. Although all ages are liable to tuberculosis, the disease is specially prone to affect the young—especially, in the case of phthisis, between the ages of eighteen and thirty.

The tubercular constitution. There is a special type of constitution commonly known as the "strumous" or the "tubercular," which undoubtedly favours the disease; sometimes so marked is this constitution that the general public may even look sadly on its possessor, with the belief that the life will soon be cut off by consumption. Suffice it to say that the chief points in this constitution, of which two types are commonly described, are a badly developed chest, a weak circulation, and a low vitality. Such cases are often regarded as being "delicate."

Injury or disease of a tissue or organ. If a joint has been injured by a blow, or if an organ has been inflamed, there is, other conditions being suitable, an increased likelihood of the development of tuberculosis in the affected part.

Unhealthy surroundings and occupations. Unhealthy surroundings and occupations play an important part in the causation of tuberculosis; especially do such conditions include absence of sunlight, dampness, and a vitiated atmosphere. Various occupations, such as that of the compositor, who is constantly breathing an impure and heated air during his work, the file-grinder, the stonemason, and the miner, predispose to the disease;

in many of these cases the lung is irritated by the particles contained in the inspired air.

Insufficient and bad food. Lastly, insufficient and bad food must be taken into account, acting as they do by weakening the body. Hitherto we have been concerned only with causes which favour the disease. We have still to ascertain what is the actual cause of tuberculosis, and how it is that the conditions we have enumerated render the patient more liable to be attacked than those in whom such conditions are non-existent.

The tubercle bacillus. Tuberculosis, which probably accounts for quite one-sixth of all the deaths in our country, is caused by a small germ, known as the tubercle bacillus. Germs are classified according to their shape; hence the name "bacillus," which means a rod.

Modes of introduction into the body. This little rod-shaped germ generally gains admission into the body with the air breathed; and if the circumstances for its residence be favourable, it not only settles down, but grows and multiplies, producing bodies known as "spores," which are harder to kill than are the tubercle bacilli themselves. But these germs may be introduced into the body in other ways than by the inspired air: for example, in the milk we drink, which may have been derived from a cow with tubercular disease of the udder; for tubercular disease attacks the lower animals as well as man. How is it, then, that we are not all attacked by tuberculosis, seeing that we probably take into our system many tubercle bacilli in the course of the day? Here it is that the predisposing causes come into operation. When the body is weakened by one or more of these factors, then the germs, entering the body, are apt to lodge in a favourable spot for their growth and development, and so long as they remain unchecked they increase their hold on the body, and eventually do mischief which not only cannot be repaired, but which may sooner or later destroy life.

Confining ourselves to phthisis, we shall now briefly mention the changes which occur in the lungs in the course of the disease. Many varieties of phthisis are described. We shall take as our example the insidious chronic type of case, which is the one most commonly met with.

The affected part of the lung, usually the apex, becomes

Changes which take place in the lung in phthisis.

studded with little nodules (tubercles) about the size of a pin's head, which gradually increase in size and run together. The diseased part of the lung has by this time become more or less solid from a chronic inflammation which affects the portions between the nodules. The next stage of the process is a softening of these nodules, whereby they tend to become transformed into a cheesy material. This softening goes on until the broken-down material is discharged, leaving one or more cavities of various size. As the process continues more and more of the lung tissue becomes affected, until both lungs may be riddled with cavities, which may be empty or may contain more or less of this cheesy substance. If the case has not progressed too far, the disease may be arrested, even when the stage of cavity formation has supervened; the cavities will then shrink, and may even become obliterated. Unfortunately this is the exception and not the rule, and cavities tend to increase in size by ulceration of their walls. Sometimes this process may cause the exposure of a blood-vessel, which may burst, either by a continuance of the ulceration, or during a sharp attack of coughing, when spitting of blood (hæmoptysis), sometimes of great severity, will ensue.

Symptoms of phthisis.

The symptoms of phthisis are at first few and often ill defined, but they are apt to be numerous later in the disease. The patient usually complains of a troublesome cough in the first place, which he cannot get rid of. This cough has very likely resulted from a severe cold or series of colds, contracted perhaps some considerable time previously, which he has never completely recovered from. There may be no other symptoms at this period. He may, however, look ill, and feel less fit for his work than usual. The doctor is led to examine his lungs, and probably detects signs which are at any rate suspicious, if not absolutely indicative, of commencing phthisis. At a later stage the temperature is apt to be somewhat raised in the afternoon, dropping in the early morning, when there is often a copious clammy perspiration. The respirations are now increased in frequency, and the cough is more troublesome; it is often described as "hacking." At first there is seldom any sputum; but the expectoration soon appears, and is most copious in the early morning. The rapidity of a case of phthisis is estimated by the time taken for the appearance

and development of these and other phenomena of the disease.

When phthisis is well established, all the symptoms and signs of hectic fever, which we have already described (see chapter xiii.), are to be observed—namely, the flushed cheek, the bright eye, the rapid pulse, the characteristic temperature, the night-sweats, and very often also intractable diarrhœa. There may be, and usually is, pain in the chest on coughing, and the sputum may sometimes be streaked with blood. The loss of flesh is sometimes very rapid and marked; in other cases it may be very gradual. Quite early in the disease a sharp attack of hæmoptysis may occur; indeed, it may sometimes be the first symptom of the disease. Many phthisical patients exhibit a peculiarly sanguine temperament as regards their recovery, even in advanced and quite hopeless cases. This characteristic the nurse will often observe.

We shall not enter into the signs of the disease as elicited by the examination of the chest, as this can only be appreciated by the medical man. The information thus afforded is of course of the highest importance, not only as regards the detection of the disease, but also in respect to its progress, its termination, and its treatment. Enough has been said to give the nurse a brief sketch of the disease, and we must now consider its management, which is of more importance to her in her practical work.

Management of phthisis. Efforts to prevent the disease.

In the first place a few words must be said about the prevention of the disease. Although this at first sight may seem rather out of place in a book for nurses, yet on further consideration it will be seen that the nurse can do a good deal in this respect, and it is only right that this branch of the management of phthisis should be insisted upon. We have seen that the disease is caused by a germ which acts especially on a certain constitution and under certain conditions. When such conditions, therefore, are known to be present, especial care will be required to protect in every way from the disease and to maintain the general health at as high a level as possible. For example, a weakly child, with perhaps a consumptive family history, may suddenly develop phthisis after an attack of measles or broncho-pneumonia. Such a child by a little extra care might have been saved from the disease. A cold, however trifling, especially when occurring

in a subject predisposed to phthisis, must on no account be neglected; and if there is the slightest suspicion of commencing phthisis, it is needless to say that a doctor must at once be consulted. It is in the very insidiousness of the disease that the danger lies. We have pointed out that the germ is usually introduced into the body with the air, and it is through the medium of the air that infection is nearly always conveyed. We know, however, that infection may take place directly from one person to another, although how frequently this occurs it would not be easy to say. As we have seen, the mere inhalation of the germs is not alone sufficient to cause the disease. All this leads us to use every endeavour to destroy the germs and their spores, which the phthisical patient is constantly discharging from his lungs, to a certain extent in the expired air, but more especially in the expectoration.

The most powerful agent we possess for the destruction of these germs outside the body is heat. All utensils used by the patient should from time to time be scalded out with boiling water: bed-clothes, body-clothes, curtains, carpets, and especially handkerchiefs, should be disinfected by boiling water or by steam.

We do not require to isolate a phthisis case, as we should a patient suffering from scarlet or other infectious fever of a like nature; but certain precautions must be observed. A consumptive patient should in every case have a bed to himself, and, whenever possible, should sleep in a separate room. The spittoons require most careful attention. This subject we have already mentioned in the chapter dealing with the nursing of the sick (chapter vii.). Sputum only becomes dangerous when it dries; hence the patient should always expectorate into a vessel containing some antiseptic solution. The sputum should in every case be burnt. This is by far the safest and most cleanly procedure.

Briefly, then, the prevention of phthisis and of tuberculosis in general may be summed up under two headings—(1) the protection of delicate constitutions, and (2) the destruction of the tubercle bacillus and its spores; and it is at these measures that both doctors and nurses unite in aiming.

In the management of the disease itself we have to deal with the actual malady, with the symptoms which

arise therefrom, and also with the complications which may occur during its course. Various measures have been and are adopted, both general and local, to influence the germs, which, having gained admission into the lungs, have commenced their destructive work. These are, as we should expect, confined more especially to early cases, but by no means entirely so. We desire, in fact, to arrest or to control the disease.

The measures adopted to arrest or to control the disease.

Climate.

Climate is of importance; it is beyond our purpose to consider this, but it may be said that, according to the type of case, a warm sheltered climate, a high altitude, or a sea-voyage may be recommended by the doctor. This is of course dependent very much on the social position of the patient; but apart from this, a change is by no means always to be recommended. In fact, the doctor must consider each case separately, and cannot lay down any hard-and-fast rule.

What is known as the "open-air treatment," in which it is sought to keep the patient in the open air as much as possible, is now being recommended and practised quite extensively in our own country, and with good results in many cases.

Maintenance of strength and of general health.

The strength and general health must be maintained in order to assist the tissues in their struggle with the germs. This includes an easily digested and nourishing dietary. Very often one of our greatest troubles in treating phthisis is the loss of appetite and irritability of the stomach, which is sometimes very hard to overcome. The appetite in such cases requires tempting. When it can be digested, the doctor includes a large amount of fatty material in the diet, as milk, cream, butter, and sometimes suet suspended and allowed to dissolve in the milk. Special forms of milk are recommended by some, such as koumiss (fermented mares' milk).

No rules can be laid down as to alcohol. It is always required, however, in cases of great weakness and prostration.

Cod-liver oil.

Cod-liver oil has come to be looked upon as a food rather than as a drug in cases of tuberculosis, both of the lungs and elsewhere. Very often there is much difficulty in getting patients to take it. On the other hand, when once the distaste for it has been overcome, it can generally be taken well and in large quantities. It may be given

alone or with one of the preparations of iron (commonly the iodide or the compound phosphate, as contained in Parrish's food), or with malt. There are many suitable preparations on the market, among which may be mentioned Scott's emulsion and Kepler's extract of malt. Commencing with a teaspoonful of oil once or twice a day, we gradually increase the quantity up to a tablespoonful or more three times a day. Cod-liver oil should always be given a little while after food—never before. Sometimes it is better taken if a pinch of salt be added to it. The oil should be pale and almost tasteless. A good plan to give it so as to prevent its being tasted is to proceed as follows:—Rinse a tumbler in water, and pour into it a little water; then carefully pour on the oil, and then over the oil pour a little more water. If this is swallowed before the oil has time to rise up through the layer of water covering it, it will not be tasted.

In cases where cod-liver oil cannot be given, extract of malt, such as the preparation we have mentioned, should be substituted. Lately an emulsion of petroleum (Angier) has been given with good results in some cases of tuberculosis. There is no doubt, however, that cod-liver oil is by far the most valuable remedy we possess in dealing with this disease.

Other methods for dealing with phthisis include (*a*) antiseptic inhalations and (*b*) antiseptic drugs given by the mouth.

Antiseptic inhalations.

(*a*) Inhalations. The substances commonly used for inhalation by means of a respirator are creasote, carbolic acid, eucalyptus, turpentine, iodine, and friar's balsam: sometimes two or more of these substances are combined together. Apart from any antiseptic action they may exert on the germs in the air-passages, they undoubtedly relieve the cough and favour the removal of sputum from the chest.

Antiseptic drugs given by the mouth.

(*b*) Various antiseptic drugs are administered by the mouth, with the object of acting, after absorption, on the tubercle bacilli. They are sometimes of undoubted benefit in controlling and even perhaps in occasionally arresting the disease, but more often they fail in their object. Some few years ago it was believed that the discoverer of the tubercle bacillus had also found out a cure for consumption, but after a thorough trial the substance was found to be unsatisfactory and of little effect on the disease. The "cure" for consumption still remains, therefore, to be discovered.

There are unfortunately very many cases in which we have tried, without avail, to influence the actual disease, and in which we can only treat the urgent symptoms and make the patient as comfortable as possible. This applies to all cases of advanced phthisis. It must be understood, however, that the doctor does not disassociate the actual treatment of the disease and the relief of its symptoms; for even in cases where the outlook is favourable there are often symptoms which require attending to quite as much as the disease which has produced them. We are now, however, considering more especially the symptoms themselves:—

Pain in the chest. (1) Pain in the chest is usually relieved by painting iodine over the seat of the disease (the tincture is generally preferred to the liniment for this purpose). Blisters or liniments are occasionally applied with the same object. Such applications may also have a beneficial action on the disease itself.

Cough. (2) Cough. In addition to the inhalations we have already mentioned, it is generally necessary to give a cough mixture (linctus), which sometimes contains morphia, combined with other expectorants.

Night-sweats. (3) Night-sweats are apt to be very troublesome. The patient must sleep in flannel. Sponging the body with tepid water, to which a little vinegar may with advantage be added, is efficacious. Belladonna, or its active principle atropine, is most commonly used for its relief. Another favourite remedy is zinc.

Temperature. (4) The temperature may be excessively high, when the various measures we have mentioned elsewhere are resorted to. Quinine is often given with advantage in these cases.

Diarrhœa. (5) Diarrhœa may and often does prove most intractable. It may be due to the actual tubercular disease of the bowel. The drugs commonly used for its relief include lead and opium (often combined, as the well-known lead-and-opium pill), bismuth, copper, and various other remedies. When other measures fail, the opium-and-starch enema often proves successful.

Loss of appetite and stomach irritability. (6) Loss of appetite and stomach irritability are usually treated by bitters, often combined with arsenic. For the dyspepsia of phthisis creasote is certainly one of our most valuable remedies.

Complications of phthisis. Of the complications of phthisis we shall refer only to two—namely, phthisis of the larynx (laryngeal phthisis), and spitting of blood (hæmoptysis). Pneumothorax we have already alluded to; it therefere requires no further mention.

Laryngeal phthisis. In laryngeal phthisis the larynx becomes filled with the little nodules which we have described as being formed in the lung. These nodules break down, and ulceration of the larynx results.

Symptoms. The voice becomes altered in tone and husky, and tends to become lost, sometimes early in the disease. The cough is more troublesome when the larynx is involved, and there is often pain and dyspnœa. The disease can only be seen by means of the laryngoscope.

Management. Local applications are made to the interior of the larynx by means of insufflators and sprays. Substances are also painted on with a brush.

Spitting of blood: hæmoptysis. Hæmoptysis is not by any means confined to phthisis. Blood may be expectorated from the lungs under many conditions, but phthisis is by far the commonest cause. The blood may be very slight in quantity, or on the other hand may be very profuse, even to the amount of several pints.

Character of the blood. The blood is usually of a bright-red colour and frothy. It must be distinguished from the blood which is ejected from the stomach (hæmatemesis), to which we have alluded in a previous chapter (chapter xxii.). Hæmorrhage may appear to come from the lungs which in reality proceeds from the back of the nose, the throat, or adjacent parts; in such cases the blood, trickling down the throat, is coughed up, often in clots. Such blood is usually mixed with mucus, and is watery in character.

Hæmoptysis, when it is at all severe, is always an alarming symptom, both to the patient and his attendants. A gurgling feeling in the chest is usually felt, and the blood is coughed up, generally mixed with the expectoration. When the quantity lost is large, symptoms of hæmorrhage will be present, such as pallor, faintness, and feeble (thready) pulse.

Management of hæmoptysis. The nurse must enjoin absolute quietness in the recumbent position, with the head and shoulders raised. The doctor must at once be summoned if the hæmoptysis amount to anything more than a mere staining of the

sputum. In the meantime a light ice-bag may be placed on the chest, and small lumps of ice be given to suck. On no account must stimulants be given. The nurse must avoid doing anything likely to worry the patient or to increase his anxiety. Relatives must be excluded and talking absolutely forbidden. Hot bottles should be applied to the feet. The nurse will take the pulse and temperature without disturbing the patient. The doctor avoids examining the chest as far as he possibly can, so as to lessen the chance of a recurrence of the hæmorrhage. The drugs which are generally administered to check hæmoptysis include ergot, turpentine, acetate of lead, and sulphuric acid. The diet in hæmoptysis must be restricted to slops, which should be given cold, or perhaps lukewarm. This precaution should be continued for from twenty-four to forty-eight hours, providing there is no recurrence of the hæmorrhage.

CHAPTER XXV.

DISEASES OF THE URINARY ORGANS.

In this chapter we shall briefly describe inflammation of the kidney (nephritis) and its results, and inflammation of the bladder. It will first be necessary to explain the meaning of the term Bright's disease, which is in common use.

Bright's disease. By Bright's disease we signify a group of diseases of the kidney, in which the presence of albumin in the urine (albuminuria) is a more or less prominent feature.

Roughly speaking, the kidney structure may be divided into three elements: (1) the part which is concerned with the secretion of the urine, (2) the framework of tissue which binds together and supports the secreting portion, and (3) the blood-vessels which are distributed throughout the organ. Now, we are accustomed to speak of at least three varieties of Bright's disease, according to the element or elements of the organ which are affected. These we shall briefly describe.

Acute Bright's disease, or acute nephritis. (1) Acute Bright's disease, or acute nephritis. It will perhaps be remembered that, when we were speaking of scarlet fever, we pointed out that one of its commonest complications was an attack of nephritis, and that this was especially likely to develop during the period of desquamation, or peeling. Acute inflammation of the kidney may also occur, though far less frequently, during the course of other fevers, such as diphtheria and typhoid. The commonest cause of acute Bright's disease is exposure to cold, especially when the skin is perspiring freely. As a result of the inflammation, the little tubes (tubules) which assist in the secretion of the urine become swollen, and their interior is often blocked with the *débris* which results from the shedding of their lining membrane. Nearly all the tubules or only quite a few may be involved. The shedding of their

Cause.

lining gives rise to the tube-casts which are generally to be found in the urine by the aid of the microscope. Indeed, in some cases these tube-casts may be our principal means of detecting kidney mischief.

The symptoms of this form of Bright's disease are often at first ill defined. The two prominent features are: (1) the condition of the urine, and (2) dropsy. The ankles become puffy, as does also the face. In the morning the eyelids are seen to be swollen, and later in the day there is apt to be well-marked swelling of the legs. The urine is diminished in quantity; it may for a time be almost or even entirely absent. It contains albumin, usually in large amount, often also blood. Other symptoms include loss of appetite, pains in the back, general debility, and sometimes slight fever. **Symptoms.**

Recovery may be complete, or chronic mischief may be left. The disease is always a serious one, especially when the urine is scanty, and convalescence is usually slow.

(2) Chronic Bright's disease. This may follow upon acute nephritis, but more often it is a separate disease. This forms one of our best examples of the ill-effects of alcoholic excess on the body, to which most cases of chronic nephritis owe their origin. Another common cause, but by no means so common as alcohol, is gout—so much so, that a kidney affected by this disease is often known as "gouty kidney." The affection is a very chronic one. **Chronic Bright's disease.**

The changes which occur in the organ are, briefly, an increase in the supporting (connective) tissue, with more or less wasting of the secreting elements, leading ultimately to a general shrinking of the kidney, which renders it useless, or almost so, as an excretory organ.

The symptoms are most insidious. In a typical case there is generally loss of appetite, with imperfect digestion and hypertrophy of the heart (see chapter xxiii.), with a hard pulse, the artery feeling like a piece of whipcord. The urine, which was perhaps diminished earlier in the disease, is now increased; albumin and tube-casts are present as a rule, but in small quantity. Vision is generally impaired, often markedly so, from changes taking place in the retina. There is apt to be dyspnœa on slight exertion. Dropsy is absent or slight in amount. **Symptoms.**

It will be seen, then, from this brief epitome of the

symptoms, that the disease affects not only the kidneys, but the heart, arteries, stomach, eyes, and other organs.

Waxy disease of the kidney. (3) The third form of Bright's disease, which attacks especially the blood-vessels, need not detain us. It is only necessary to say that it sometimes occurs in the course of certain wasting diseases—as, for example, the various manifestations of tuberculosis—and shows itself in the first place by an increase in the amount of urine passed.

Uræmia. Before passing to the management of Bright's disease, a group of symptoms must be noticed which is apt to supervene in the course of the disease, especially in the chronic variety, but by no means entirely so. These symptoms constitute the disease uræmia. Uræmia may be acute or chronic. It is caused by the poisonous effects on the nervous system of certain of the urinary elements, which are apt to become absorbed when there is an interference with the secretion or the discharge of the urine.

Symptoms. The symptoms vary in different cases. They are best marked in acute uræmia. They include vomiting, severe headache, interference with sight (it may be even temporary blindness), muscular twitchings, sometimes general convulsions, delirium, and irregular breathing, not uncommonly of the "Cheyne-Stokes" type. The convulsions are often succeeded by coma, but the patient may be comatose from the commencement. Death may result in a few hours in the most acute cases, the coma rapidly becoming more profound; or the disease may be prolonged for weeks or even months in chronic uræmia.

The outlook is, as a rule, more hopeful in acute uræmia, although the symptoms are more alarming while they last. Chronic uræmia is seldom, if ever, recovered from. Patients are sometimes brought into hospital unconscious with well-marked convulsions or in a comatose state. In either case the doctor thinks of uræmia as a possible cause among other conditions, such as epilepsy, apoplexy, acute alcoholism, and belladonna or opium poisoning. Under such circumstances the presence of albumin in the urine may aid in the diagnosis.

Management of acute Bright's disease. In our management of a case of acute Bright's disease we endeavour to allay the inflammation in the kidneys and to promote the secretion of urine, which tends to wash away the inflammatory *débris* from the tubules. The

kidneys are the chief organs which remove from the body the waste products of nutrition. As their function is interfered with increased work must be thrown on the skin. We therefore promote the secretion of sweat by baths and drugs. Again, we favour the elimination of waste material by keeping the bowels freely opened. In the next place we support the strength, for the disease is an exhausting one. Lastly, urgent symptoms, such as pain, sleeplessness, and, of course, uræmia, must be managed as they arise. Such, then, are the indications for treating acute nephritis.

The inflammation is allayed by certain local measures, which include dry and wet cupping, leeching, poulticing, and fomenting the loins. By far the best way to promote the secretion of urine and to flush the tubules is to give plenty of fluid drinks—milk, lemonade, barley-water, lime-water, and the like. These are usually supplemented by drugs which increase the quantity of urine (diuretics). Of this class of drugs digitalis is the favourite. Other examples are saltpetre, sweet spirits of nitre, juniper, and broom-tops. We act on the skin by vapour baths and the wet pack; hot-water bottles may be applied to the feet. Drugs to promote the secretion of sweat (diaphoretics) may be combined with diuretics or given separately. Pilocarpine acts rapidly in this manner; it is usually injected under the skin. To produce the watery stools we desire, and thus to relieve the dropsy, we make use of certain purgative drugs, among the most common of which are blue-pill, compound jalap powder, cream of tartar, and elaterium.

Diet.

In order to give the kidneys as little work to do as possible we avoid solid food, and in the early stages keep the patient almost or entirely to a milk diet, allowing him to partake freely of the bland drinks already mentioned. Stimulants are rarely required. Tonics are given later or when the acute symptoms have subsided.

Management of chronic Bright's disease and of uræmia.

Chronic Bright's disease is not so satisfactory to manage, for we can as a rule only treat the symptoms. Nothing further requires to be said, then, in this connection.

Uræmia, under whatever circumstances it may occur, demands prompt treatment. The general principles laid down for the management of acute Bright's disease are especially necessary here; we refer to the promotion of the secretion of urine and of the action of the bowels and skin. Blood-

letting is sometimes resorted to. The convulsions are usually best controlled by the inhalation of chloroform. It may be necessary to inject morphia under the skin, but we do without it when we possibly can, as it tends to diminish the quantity of urine, which we wish to avoid.

Other diseases of the kidney. Dropsy will be treated on very similar lines to those described when considering heart failure (see chapter xxiii.).

Among other diseases of the kidney, which it will merely be necessary to mention, are stone in its substance (renal calculus), tubercular disease (tubercular kidney), tumour, "floating" or movable kidney, and dropsy of the kidney (hydronephrosis). The last named results from obstruction of the ureter, which prevents the outflow of the urine into the bladder.

Inflammation of the bladder: cystitis. Inflammation of the bladder belongs to the surgeon rather than to the physician: still, it will be convenient to consider the disease in this chapter. It is known as cystitis. The disease may be acute or chronic.

Cause. The acute form of cystitis often follows operations on the bladder, or an injury either from a sound, catheter, or fragments of a crushed stone (see Lithotrity, p. 207). Chronic cystitis, the commoner variety, may follow an acute attack or may start as such. It is very liable to occur when there is an obstruction, partial or complete, to the outflow of urine from the bladder. A stone or tumour nearly always sets up chronic cystitis. Lastly, inflammation may spread to the bladder from the neighbouring organs.

Symptoms. The chief symptoms of cystitis, which are always more urgent in acute cases, are inability to hold the urine for long, which gives rise to a constant desire to pass water. As soon as a little urine collects in the bladder the patient begins to feel pain, which is only relieved by emptying the bladder. In severe cases there may be a high temperature, feeble pulse, and all the symptoms of the typhoid state. The condition of the urine has already been described. Suffice it to say that it is alkaline, very offensive, and generally contains much mucus, often mixed with pus (muco-pus).

Management of cystitis. The management is directed towards keeping the inflamed organ at rest, a principle we endeavour to apply to all inflamed tissues and organs. We also try to cleanse the mucous membrane of the bladder. Any cause which may be keeping up the inflammation is, when possible, removed.

In acute cystitis hot hip baths may be given with advantage once a day or oftener. The bladder is to be washed out daily either with plain warm water or, when the urine is very offensive, with warm boracic lotion. The most convenient apparatus for washing out the bladder consists of a glass funnel to which rubber tubing is fixed. This is, in its turn, fixed on to the end of the catheter, which has been passed into the bladder. The patient lies on his back, and the funnel is filled with water and lifted above his head, when the lotion flows into the bladder by syphon action. In the same manner, by depressing the funnel below the level of the patient, the bladder is emptied. It may sometimes be necessary to open the bladder through the perineum to procure thorough drainage. Certain drugs, administered internally, have a beneficial effect on the urine, such as boracic acid, benzoate of ammonium, hyoscyamus, and some of the potash compounds. Remedies such as these are often prescribed.

The diet is usually confined to milk in acute cases : under **Diet.** any circumstances a low dietary is ordered, and such patients are better without stimulants, unless there be much prostration.

Pain is often severe, and opium may be required for its relief, generally in the form of a morphia suppository. Locally, poultices and fomentations applied over the bladder are comforting, and tend to relieve pain.

CHAPTER XXVI.

CERTAIN CONSTITUTIONAL AND GENERAL DISEASES.

THERE are certain diseases which are best grouped together under the above heading, and some of these we shall now describe.

Acute rheumatism, or rheumatic fever. We shall begin with the affection known as acute rheumatism, or rheumatic fever. This disease has some points in common with the affections we described under the term "specific fevers," inasmuch as it is characterised by the feverish state and its accompanying symptoms. Again, it is not improbable that it is caused by a germ, although this is not yet ascertained; but it has been thought best to include it under the above heading because it is in no way an infectious disease.

Cause. Rheumatic fever is caused by exposure to cold and damp, especially in those who have either a rheumatic family history or who have already had the disease.

Symptoms. It generally commences with vague pains in the limbs and a feeling of general illness. The temperature soon commences to rise, and there may now occur several attacks of shivering. A severe pain is complained of in one or more of the joints, often the knee or ankle. This pain is made worse by any movement, consequently the patient lies very still. A peculiarity of the disease is the tendency for the pains to fly from one joint to another; it is usually the larger joints which suffer most. An affected joint will be found to be swollen, hot, and red, and often a considerable amount of fluid is poured out into its interior. The other symptoms of fever which we have so often enumerated are more or less marked, and the disease is nearly always a serious one, causing great constitutional depression. The skin, instead of being dry, as we might expect, is generally

bathed in perspiration, which has a peculiar, strong, sour odour.

The nurse will often be struck with the rapidity with which the joints are involved, the inflammation flying quickly from one joint to another, so that a joint which is severely inflamed one day may by the following day have entirely recovered, while others have become painful and swollen. The disease varies considerably in its duration. As soon as the joints cease to be involved, the fever and general symptoms gradually subside, and convalescence becomes established. Relapses are not at all uncommon.

Complications of rheumatic fever. There are several complications which are apt to arise in the course of the disease. We shall refer to two, the first of which is certainly the one most commonly met with—namely, inflammation of the heart and pericardium (endocarditis and pericarditis). **Inflammation of the heart.** It is probable that the heart is affected in at least half of the cases of acute rheumatism, and it is specially liable to occur in children. Every medical man, therefore, carefully examines the heart, when he has to do with this disease.

Hyperpyrexia. The second complication is much less common. It is known as hyperpyrexia, a term used to denote a very high temperature. In a few hours the temperature may rise to 107°, and occasionally even as high as 110°. In such a case the patient becomes excited; his face is flushed, his eyes bright and restless, and the pains, which have been perhaps very severe, now cease. These symptoms will, if unrelieved, be followed by unconsciousness or convulsions, and death may rapidly ensue. Hence the importance of the nurse being alive to the occurrence of hyperpyrexia, and being able to recognise its onset. Phenomena such as these, with a temperature of 104° or over, demand prompt action.

Management. The management of rheumatic fever is a question of considerable importance to the nurse, because it is one of those diseases where so much depends on skilled nursing. The nurse will remember that she has to do with a long-continued and painful disease, accompanied by fever. The management will therefore include that of the fever, and also the local evidence of the disease as displayed in the joints. It is generally recommended that the patient lie between blankets, so that the copious perspiration may be absorbed

and chill prevented. The nightgown should be of flannel for the same reason. It is a good plan to slit up the front and sleeves, and attach tapes for fastening, so that access may be had to the chest and arms without moving the patient—an important point when every movement may cause pain. Every movement of the inflamed joints must be avoided, and the patient may therefore have to be fed entirely. The use of the bed-pan may even be contra-indicated in severe cases. The skin must be frequently sponged with tepid or warm water to prevent the chilling of the body, which is so apt to occur from the evaporation of the perspiration; apart from this, the patient is rendered more comfortable, and rest and sleep are thereby promoted.

Applications to the joints. Regarding the joints themselves, probably the most satisfactory application is absorbent cotton-wool, kept in place by a loosely applied flannel bandage. Some people prefer flannel to the wool. The use of splints and plaster of Paris for firmly fixing the joints has been adopted on the Continent with good results, but in our own country they have not come into general use. A casing of well-padded cardboard open in front, for the joints of the upper and lower limbs in cases where there are painful "startings," can be recommended, as being less stiff than the former, and more readily adapted to the joints. When the pains are severe, it is usual to paint some soothing remedy over the affected joints; probably the best of these is glycerine and belladonna. Fomentations are used for the same purpose, on which a few drops of laudanum may be sprinkled. The application of cold is not so efficacious, except perhaps at the very commencement.

General management.

Drugs. By far the most valuable remedy in rheumatic fever is salicylate of soda and allied drugs, such as salol and salicin. By it the temperature is reduced and the pains relieved; but in addition to this the drug has a distinct action on the rheumatic poison, whatever this may be. After the bowels have been well opened it is given in moderately large doses for a few days, when the dose is either lessened or the drug temporarily stopped. Salicylate of soda and its congeners have, however, a depressing effect, and, when given for some time in moderate doses, give rise to a peculiar set of symptoms, which may, in susceptible subjects, appear after one or two doses of the

drug. Among these symptoms are ringing in the ears (which the patient sometimes likens to the sound of church bells), deafness, increase of the pulse-rate, and sickness. Although salicylate of soda has disadvantages such as those enumerated and does not always succeed, yet it has been found to give by far the best results. Until it came into use the alkaline drugs, namely soda and potash, used to be chiefly depended upon, and these are still used freely by some doctors.

Diet. The diet in rheumatic fever is that of fever generally, plenty of milk and cooling drinks being allowed. Potash- and soda-water may be drunk freely. When the fever has subsided, fish and milk-puddings are added to the diet. Meat is withheld until the disease has disappeared.

Hyperpyrexia. Hyperpyrexia demands the application of cold baths or the wet pack. A point the nurse must not fail to observe is to watch the temperature and pulse during the application of cold, and to cease its application when the temperature in the mouth is a couple of degrees higher than the point to which we wish to reduce it. This is because the blood in the interior of the body which causes the thermometer to register the temperature in the mouth is much warmer than that which is circulating in the skin; so that when the blood becomes mixed the temperature will then be lower than it is at our time of observation. To reduce the temperature to normal, therefore, it would be necessary to cease the application of cold when the thermometer in the mouth stood between 100° and 101° F.

During convalescence, which is always protracted, the nurse must prevent her patient exposing himself to sudden extremes of temperature, and in cases of heart complications the greatest care must be taken to prevent any undue exertion. In such a case walking about will generally be forbidden for some days after the patient has been permitted to get up, so liable is further damage to be done to the heart. The frequency of this complication must never be lost sight of.

The other forms of rheumatism in which the disease is of a chronic nature may affect the joints (articular rheumatism) or the muscles (muscular rheumatism). These need not detain us, and we pass on to the disease commonly known as gout.

Gout. Gout, although occurring far more commonly among the higher classes of society, is by no means confined to them, for the disease is often met with in the hospital patient, sometimes accompanied by rheumatism. Gout may be acute or chronic. The disease is usually referred to the joints, very commonly to the big toe, but the other systems of the body tend to become affected in the course of the disease. We have seen an example of this already in the chronic form of Bright's disease (see p. 329).

Cause. The precise cause of gout is probably not known. The disease is markedly hereditary and is commoner in men, and there is a special type of constitution (gouty constitution) which is specially prone to be attacked. Rich living certainly favours gout, but it cannot be said to be often, by itself, a cause; generally there is a gouty stock, and the gouty constitution superadded. Other causes which tend to bring on an attack in gouty subjects are grief, worry, and great fatigue.

A gouty joint becomes enlarged and often deformed. Were we to open such a joint, we should find the ends of the bones covered with a white powdery material, representing the dried-up crystals (urate of soda) which have been deposited there by the blood. Sometimes little "chalk-stones" are to be seen and felt in the neighbourhood of gouty joints, and in other situations, as the ear. These stones in due course tend to ulcerate their way through the skin, and are thus discharged. They are made up of the same material which covers the joint-ends of many of the bones, and which has become solidified.

Acute attack. An acute attack of gout generally comes on suddenly with a severe pain in the affected part: for example, the great toe. The sufferer cannot bear the slightest touch, and sometimes will not even allow any one to come near the foot, for fear of knocking against it. The toe becomes swollen, and the skin is often tight and shiny over it. There is usually a general rise of temperature, with symptoms of mild fever. In a few hours the pain abates, but is apt to recur later in the day. The attack passes off in a few days, unless there be chronic gout, when it lasts longer.

Management. The management of gout includes its prevention, for as often as not the disease is a preventable one. Moderation must be the watchword of a gouty individual, both in rich

foods and in alcohol. Some forms of the latter, such as port wine, are generally entirely forbidden.

There is one exception to this principle—namely, the gout of "poor living," which is treated on generous lines.

Firstly regarding local measures. The foot is raised on a soft footstool, and some soothing lotion is applied; occasionally hot applications are preferred. It may suffice to wrap up the part in cotton-wool, and cover this with gutta-percha tissue. The most valuable drug we possess for the cure of gout is colchicum: this is usually given without delay. The bowels are well opened and kept freely acting. Pain may require the internal administration of opium or morphia. A very light diet is ordered. While the acute symptoms are present the patient is confined to slops, milk, milk-puddings, potash- or soda-water. A little later beef-tea, fish, and white meat are allowed.

In chronic cases many drugs are recommended. They are often combined with a course of mineral waters at home, or, when possible, at some suitable watering-place, such as Bath or Buxton in our own country, Carlsbad, Aix-la-Chapelle, and Baden-Baden on the Continent.

In the management of chronic gout and chronic rheumatism the nurse will find that a knowledge of massage will stand her in good stead.

Syphilis.

The nurse cannot fail in the course of her work to meet with the disease known as syphilis in one of its various manifestations, both in adults (acquired) and in children (congenital). It is not our intention to do more than mention this malady, which is often spoken of as "specific disease" (always so in front of patients).

Acquired syphilis.

In our hospitals it is more usual for the disease to be encountered by the nurse in its later stages. She must remember that in its second stage the disease is contagious, inasmuch as it may be conveyed from one to another, for example, by kissing, by giving such a patient's pipe to another person to smoke, or by using the same spatula for another patient without thoroughly cleansing it. Cases such as these, if they be admitted into a general ward, should have their utensils, eating and otherwise, kept quite separate and marked by some distinguishing sign. It is recommended to keep in every ward a separate spatula for examining the throat of such cases.

Congenital syphilis.

Congenital syphilis manifests itself in various ways, both in infancy and throughout childhood to adolescence. The teeth, nose, bones, and eyes are specially prone to suffer.

Treatment of syphilis.

There are two drugs which stand out above all others as invaluable in syphilis. They are our best examples of "specific" remedies (hence the name "specific" applied to the disease). We refer to mercury and iodide of potassium. Mercury is given internally in the form of pills, powders, tabloids, or in mixture, and it is applied as lotions, ointments, and dusting-powders to the body externally. After prolonged use, occasionally earlier, mercury is apt to cause looseness of the teeth, soreness of the gums, and an increase in the salivary flow (salivation), symptoms which, although common some years ago, are now seldom met with, except in slight degree (see Stomatitis, chapter xxii.). Whereas mercury is more efficacious in the earlier manifestations, iodide of potassium is especially valuable in the third stage of syphilis, when it is usually combined with mercury in a mixture.

Lead-poisoning.

Lead-poisoning (plumbism) is a good example of a trade disease, occurring among painters, type-founders, compositors, and others who use the metal and its compounds in their work. The poison may be introduced with the air, or with the food and drink, and the symptoms produced may be occasionally acute, but are nearly always chronic: it is the latter alone to which we shall refer. Outbreaks of lead-poisoning are not uncommonly due to contamination of the drinking-water. Briefly, this occurs through the water, under certain conditions, acting on the lead pipes or lead cisterns in which it is contained.

Symptoms.

The nurse will notice certain symptoms which are apt to be very characteristic of lead-poisoning. A severe colic is often complained of (lead colic), which causes the patient the most agonising pain in the abdomen. Previous to this attack, however, there are generally to be noticed a sallowness of complexion and digestive derangements, perhaps a sweetish taste in the mouth, and also a blue line on the gums close to the teeth. There is obstinate constipation. Another well-known sign is inability to raise the hand with the arm (wrist-drop); other muscles besides those affected in wrist-drop may also suffer.

Like some other diseases the management of lead-poisoning resolves itself into the preventive and the curative. **Management.**

The utmost cleanliness in the habits of those who are exposed to the risks of lead-poisoning is insisted on. Food must never be taken without first washing the hands, and no meals should be taken in the workroom. Free ventilation of workshops and their regular inspection by Government officials are demanded. Sometimes a lemonade which contains sulphuric acid in weak solution is provided as a drink in workshops as a preventive measure. Any lead taken into the system thus combines with the sulphuric acid to produce a harmless compound. **Preventive.**

We try to relieve the severe pain of lead colic by obtaining free action of the bowels, and by applying fomentations to the abdomen. Opium or morphia is often necessary. Sometimes calomel and opium are combined with the double object of moving the bowels and relieving the pain. As has been said, we try to convert the lead which is circulating in the body into an inert and harmless compound: we therefore select drugs which will achieve this object. Of these our most valuable remedy is iodide of potassium. In addition to sulphuric acid, Epsom salts is of benefit in this respect. For the various forms of lead paralysis the hypodermic injection of strychnine in minute doses answers best. This is combined with electricity and massage. **Curative.**

We mentioned acute alcoholic poisoning when we considered the subject of poisoning (chapter xviii.). We have now to describe a set of symptoms which the nurse may from time to time meet with, either in the medical or surgical ward, to which the name delirium tremens is given.

This disease occurs under various circumstances in alcoholic subjects. **Delirium tremens.**

It may be induced by a debauch, especially when the body is fatigued—as, for example, from long fasting. The chronic drinker is more liable to the disease than the man who occasionally indulges in a drinking-bout. Delirium tremens not uncommonly occurs in the course of a severe disease, such as pneumonia, or it may follow upon a serious injury or shock in an alcoholic subject. **Causation.**

The principal symptoms are a complete loss of appetite, sleeplessness, muscular tremors, which give the name **Symptoms.**

(tremens) to the disease, and various illusions, such as alarming sights and sounds. There is marked restlessness, both of mind and body. In severe cases the heart's action and the pulse may be very feeble, and other serious symptoms may ensue. Suicide or even homicide may be attempted.

Management. The management of this disease will sometimes tax the nurse severely. Often a male attendant will be required. In our large hospitals it is customary to set apart a special ward for such cases.

The patient must on no account be left night or day, and he must not be restrained by any mechanical means whatsoever. Any articles with which he might be able to damage himself or others must be carefully removed, such as razors, knives, and the like. In the vast majority of cases the medical man stops the drink entirely, and both doctor and nurse require to be firm, however much the patient may beg and crave for alcohol. There are two other important principles to be kept in mind: (1) To get food into the system by one means or another. If the stomach is so irritable that nourishment cannot be retained, as not uncommonly happens, then we must feed per rectum. Eggs, beef-tea, strong soups, milk, custards, and arrowroot are the chief articles to be selected. It is frequently necessary to peptonise foods, always in the case of rectal feeding. Nourishment must be given frequently. (2) To procure sleep. Bromide of potash or chloral, or, better still, a combination of the two (bromidia), is generally given for this purpose. If we can fulfil these two requirements, the case is usually a hopeful one. People are, however, apt to die suddenly in the course of the disease; and all cases of delirium tremens must be regarded as serious.

Diabetes mellitus. We have thought it better to consider the disease known as diabetes mellitus, or simply diabetes, in this chapter, rather than in that dealing with diseases of the urinary organs; for although its principal symptom is referred to the urine, yet the urinary organs are not themselves necessarily implicated, and the phenomena of the malady are generalised over the different systems of the body. It is, in fact, a general rather than a localised disease.

Diabetes mellitus is characterised by the presence of sugar in the urine. It is unnecessary to again describe

the character of the urine in this disease. For this the nurse is referred to chapter x.

Many theories have been put forward to account for the disease. We shall be content to say that there is an excess of sugar in the blood, which, instead of being utilised for the nutrition of the body, is discharged in the urine.

Symptoms. In addition to the symptom already mentioned, the malady possesses certain well-marked features. Thirst is complained of, also a voracious appetite. The patient feels languid and tired, and loses flesh, sometimes rapidly.

The outlook is usually unfavourable; for although a more or less complete cure may sometimes occur, especially when the disease attacks the middle-aged, yet the vast majority of cases die in from six months to four years. Death may occur from phthisis or pneumonia (to which the diabetic is especially prone), from exhaustion, or from a condition of coma (diabetic coma).

Management. Our principal object is to diminish the quantity of sugar in the urine. We also aim at supporting the strength and relieving symptoms, such as thirst and constipation.

Diet. The diet is of great importance. Many doctors believe in cutting off entirely or almost entirely that class of foods which contains starch and sugar—namely, the carbohydrates. Others believe that it is necessary, and even best, only to limit the quantity taken. Some of our commonest articles of diet contain starch: for example, bread, potatoes, peas, beans, and turnips. If the patient is to be strictly dieted, these will have to be forbidden. We substitute for bread gluten bread, bran, and almond cakes. If these cannot be obtained, the bread must be well toasted. The best guides for the regulation and restriction of the diet are (1) body-weight and (2) condition of the urine, both as regards the quantity passed and the amount of sugar contained therein.

It will be the duty of the nurse to assist the doctor in keeping a regular report of the urine, and also of the patient's weight. It is customary to draw up the urine report twice a week, sometimes oftener, and to record the weight once a week. The nurse must, however, measure the quantity of urine passed day by day, and the specimen for the doctor's examination must be taken from the mixed urine of twenty-four hours.

It does not follow that the urine will be free from sugar because all carbohydrates are rigorously excluded from the diet; for it has been shown that sugar may be formed from nitrogenous food. We can, however, limit very materially the excretion of sugar by judicious dieting and other treatment. The patient will depend largely for his diet on such articles as milk, cream, butter, all kinds of meat, fish, eggs, greens, Brussels sprouts, lettuce, and watercress. Tea, coffee, and cocoa are allowed. For sweetening, saccharin and an extremely sweet substance known as saxin are used as a substitute for sugar.

The diabetic must lead a regular and quiet life, taking a moderate amount of exercise and carefully avoiding exposure to cold and wet.

Drugs. A very large number of drugs have been recommended for diabetes. The most valuable is opium, and one of its active ingredients, codeia, is a favourite and commonly used remedy. Arsenic has its advocates; it is sometimes combined with opium. To relieve thirst, a slightly acid drink often answers well, such as water containing a few drops of diluted sulphuric acid.

Rickets. Rickets (rachitis) is a constitutional disease in which many parts of the body suffer, although its effects are most noticeable in the bones, which become softened and consequently more or less deformed. It is most commonly met with during the first two years of life, especially among bottle-fed and weakly children. Teething is generally delayed.

Treatment. Treatment must be preventive and curative. The former aims at removing children, when possible, to healthy surroundings, and paying strict attention to the rules of feeding. The latter includes the former, and also the administration of drugs, such as lime, iron, and cod-liver oil, and the removal or correction of the resulting deformities.

CHAPTER XXVII.

DISEASES OF THE NERVOUS SYSTEM.

It has already been mentioned that the nervous system is the most complicated part of the whole body and the most difficult to understand; the same may be said to apply to the diseases to which it is liable. So intimately is it connected with and so completely does it control every organ of the body, that disease of the former is very apt to influence the normal action of these organs: for example, it may cause such symptoms as vomiting, irregular action of the heart, difficulties in respiration and micturition; but there are certain symptoms attributable to nervous diseases only, and these we shall now briefly consider. They may be classed as follows: those connected with (*a*) motion, (*b*) common sensation, (*c*) special sensation, (*d*) nutrition, and (*e*) the intellectual powers.

Symptoms commonly met with in disease of the nervous system.

(*a*) Motor symptoms. The muscles may lose their power: this condition is called paralysis, and may arise from disease of the brain, the spinal cord, or the nerves, or even occasionally of the muscles themselves. The loss of power may, however, not be complete (partial paralysis or paresis).

Motor symptoms.

Paralysis, complete or partial.

When muscles contract involuntarily, they are said to be in a state of spasm or convulsion. If the spasms are rapidly interrupted, they are called clonic; if they are continuous over a given period of time—for example, a minute, an hour, or a day—they are known as tonic. The simplest form of clonic spasm is a trembling (tremor), which occurs in many diseases, and varies from a slight twitching of a part to a well-marked shaking, as in shaking palsy (paralysis agitans). Other forms are sneezing, hiccough, and the movements met with in epilepsy and hysteria, and,

Involuntary muscular contractions, clonic and tonic.

in fact, in all kinds of convulsions. Tonic spasm most frequently occurs as cramp. It consists of painful and continuous contractions of one or more muscles, which become hard and rigid. It is a well-marked feature of tetanus.

Choreic and other involuntary movements. There are certain other involuntary movements which can be hardly included in either of these groups. Among these are the irregular muscular contractions which occur in St. Vitus's dance (chorea), a disease which we shall have to consider later on.

Co-ordination and inco-ordination. Every movement which we perform depends on the harmonious action of muscles or groups of muscles: the more delicate the movement is, the more complete does the harmony require to be. This harmonious action we speak of as co-ordination; the opposite condition is known as inco-ordination, or ataxia. This is a prominent symptom in the disease known as locomotor ataxia. It may only be detected when the patient is called upon to perform some delicate movement, such as to walk along a straight line or to shut his eyes and place his finger on the tip of the nose, when the gait is staggering and the movements are irregular and uncertain; or it may be so marked that the patient is quite unable to walk alone.

Electricity in medicine. Electricity is used largely for the detection and the treatment of many diseases of the nervous system. Two forms are used in medicine: (1) the faradic or interrupted, and (2) the galvanic or continuous current. The former stimulates the nerves and their endings in the muscles; the latter, in addition, stimulates the muscular substance itself.

Changed electrical conditions. As a result of such electrical stimulation the muscle or muscles contract. When, however, the nerves or muscles are affected, the electrical reactions are modified or entirely lost, and important evidence is thus obtained from the observation of such alterations. The nurse should be able to fit together an ordinary battery.

Reflex action. We have seen that the spinal cord has the power of transforming sensory (afferent) into motor (efferent) impulses apart from the brain, and that this is known as reflex action. A message travels along a sensory nerve to the spinal cord, and returns in the track of a motor nerve. Provided the circuit, so to speak, is unbroken at any point, this furnishes us with an index to the healthy action of the spinal cord at any particular level. If we excite a sensory nerve and

obtain no response, we conclude that some part of the circuit is broken. If the nerves themselves are healthy, then the cord is at fault: it has failed to transmit the message onwards from the sensory nerve to the corresponding motor nerve; in short, the integrity of the reflex loop concerned is impaired. Reflex movements may be excited by stimulating the skin or mucous membrane at various points (superficial reflexes) or the tendons or other deeper structures (deep reflexes). We have already given examples of these (p. 52). The reflexes may be increased when the spinal cord is unduly excited, or when the controlling influence of the brain is in abeyance. When a part of the cord is diseased, or the nerves which enter (sensory) or leave (motor) that segment, then, the reflex loop being interfered with, the reflexes, which depend on its integrity, are diminished or entirely lost.

Changes in the reflexes.

(*b*) Sensory symptoms. These may be divided into those which the patient complains of himself and those which are elicited by examination. The former group includes the various kinds of pain, arising apparently without any local cause, such as the various forms of neuralgia and headache; also certain other sensations—for example, heat and cold (apart from actual change of temperature), numbness, tingling, and giddiness. The latter group refers to changes in the actual sensibility of the surface of the body in any given area. Sensation may be found to be entirely lost (anæsthesia) or exaggerated (hyperæsthesia) on touching or pricking the skin or applying an electric current to the part. Again, the patient may mistake heat for cold, or fail to distinguish between hot and cold bodies. The sense of temperature is usually tested by means of hot and cold water in two test-tubes: these are applied to various parts of the body, and the patient's sensations recorded.

Sensory symptoms

(*c*) Symptoms connected with the organs of special sense. Sight may be interfered with in various ways in nervous diseases: for example, there may be diminution in the acuteness or the range of vision, or the sight may be entirely lost. The field of vision is determined roughly by means of the hand held in various positions: it is accurately mapped out by an instrument called the perimeter. To find out the acuteness of vision we employ test-types, and if none of these can be seen the patient is asked to count fingers

Symptoms connected with the organs of special sense.

Sight.

at various distances; and in the worst cases we have to rely on the power to perceive light from darkness. There may be intolerance of light from over-sensitiveness of the retina. The pupils may be unequal, or fail to dilate and contract when covered and exposed to the light respectively. The muscles which move the eyeball may be completely or incompletely paralysed, from affection of the third, fourth, or sixth cranial nerves. The ophthalmoscope is of much value in the examination of many nervous affections in which disease of the optic nerve or retina is suspected.

Hearing. The sense of hearing may be impaired or lost, or it may be exaggerated into painful impressions. There may be various sounds complained of, such as humming, ringing (tinnitus). Such symptoms have frequently their origin in affections of the outer and middle ears: it is with the inner ear, where the auditory nerve ends, that we are at present concerned, and the part of the brain where the sense of hearing is located. For estimating the acuteness of hearing we make use of a watch, noting the distance from the ears at which its tick can be heard, and comparing the result with the normal distance. Another and more important means of testing the acuteness of hearing is by use of the tuning-fork. The fork is struck and made to vibrate; its stem is then placed against the teeth or the top of the head, when its vibrations are communicated directly to the inner ear through the bones of the skull, and are in normal conditions perceived equally in both ears. The vibrations do not pass through the outer and middle ears, as do the ordinary waves of sound. Thus a person who is deaf to ordinary sounds may perceive the vibrations of the tuning-fork: this tells us that the cause of the deafness is located not in the inner but in the middle or outer ear.

Taste and smell. Both taste and smell are liable to be impaired, lost, or otherwise perverted in diseases of the nervous system. To test the acuteness of taste certain substances in solution are placed on the protruded tongue, such as sugar, quinine, vinegar, and salt, which give rise to sweet, bitter, acid, and saline tastes respectively. In the same manner the acuteness of the sense of smell is ascertained by giving the patient certain substances with a strong odour to smell, such as camphor. Irritating substances, such as ammonia, should not be used for this purpose.

(*d*) Symptoms dependent on changes in nutrition. These changes may affect the muscles, the bones and joints, or the skin, producing respectively muscular wasting, brittleness of the bones, with disease of the joints, and often ulceration of the skin over points of pressure. This last constitutes what may be considered as the unavoidable bed-sore; for although the nurse must be very loath to regard bed-sores as unavoidable, yet it cannot be denied that, do what she will, they will sometimes form under such circumstances. Such ulcers are spoken of as "trophic," because the nutritive or trophic influence—whatever that influence may consist of—has been impaired or lost. **Symptoms dependent on changes in nutrition.**

(*e*) Symptoms dependent on changes in the intellectual powers. As examples of such changes may be mentioned impairment of memory, speech, attention and power of judgment, various delusions, delirium, and loss of consciousness (coma). In this connection may be mentioned the disorders of sleep—namely, sleeplessness (insomnia) and excessive sleep (somnolence). **Symptoms dependent on changes in the intellectual powers.** **Disorders of sleep.**

We are now in a better position to consider briefly some of the commoner diseases of the nervous system. These we shall take up in the following order: affections of the nerves, of the spinal cord, and of the brain.

(1) Affections of the nerves. The term neuralgia is used to signify pain in connection with a nerve and its branches, rather than pain of a more general character and distribution. **Affections of the nerves.** **Neuralgia.**

The causes are numerous, some rendering the individual more liable to the affection than he would otherwise be, others actually producing an attack. Of the latter group of causes cold and irritation of the ending of a nerve are probably the most frequent examples. The pain is often shooting in character. It may come on at regular periods, and may last from a few minutes to, it may be, months. Two of the commoner varieties of the disease are facial neuralgia, due to involvement of the fifth cranial nerve (tic-douloureux), and sciatica (neuralgic pain referred to the thigh). **Causes.**

The management of neuralgia consists in trying to remove the cause: for example, a decayed tooth. Next we relieve the pain by drugs, administered internally or applied locally, and by such remedies as heat, moist or dry, or some form of counter-irritation. **Management.**

Neuritis. Inflammation of a nerve is called neuritis. Only one nerve may be involved or a group of nerves, and the results will depend on the character and degree of inflammation, and the nerve or nerves implicated.

Causes. The causes include injuries, such as wounds or blows; pressure; cold; and special poisons, as that of diphtheria; also certain chemical substances—for example, alcohol and lead.

Symptoms. Among the more common symptoms are pain in connection with the affected nerve, anæsthesia or hyperæsthesia in the case of a sensory nerve, and paralysis of the muscles supplied by it in the case of a motor nerve. Two or three examples of such paralysis may be given. When the facial nerve is affected, the muscles on the corresponding side of the face (muscles of expression) are paralysed. The patient cannot close his eye, elevate his eyebrows, whistle, or perform other movements which depend on the action of these muscles. When the third cranial nerve is paralysed, the upper lid droops, and the patient cannot raise it. In lead-poisoning a common symptom is "drop-wrist," which is probably due to implication of the nerve-endings in the muscles on the back of the forearm.

Affections of the spinal cord. (2) Affections of the spinal cord. Inflammation of the spinal cord (myelitis) is nearly always an acute disease.

Causes. The commonest causes are injuries to the spine and exposure to cold and wet, especially from lying on damp grass. It also sometimes follows on certain fevers.

Symptoms. The symptoms depend very largely on the part of the cord which is affected. The inflammation may spread vertically or transversely, and several inches of the cord may be involved. Two stages are generally recognised: (*a*) A stage of irritation or increase of function, when pain in the back and along the course of the nerves connected with the inflamed area and various other sensory phenomena are present, together with increase of the reflex movements. (*b*) A stage of paralysis or loss of function. Now sensibility is diminished and finally lost on one or both sides of the body below the inflamed area, and this is accompanied by a corresponding impairment and loss of muscular power (paralysis). The bowels and bladder may be affected. The urine may be retained, from inability to pass it, owing to paralysis of the bladder: this is often followed by

unconscious micturition, as messages from the bladder to the brain cannot now be transmitted along the cord. The nutrition of the skin suffers, and bed-sores (trophic) are very apt to form over points of pressure, such as the sacrum, trochanters, and heels. The inflammation may spread upwards, and, by involving the cervical part of the cord, may cause paralysis of the respiratory muscles and death. Myelitis may also prove fatal, from exhaustion or from blood-poisoning following upon the extensive bed-sores. Inflammation of the bladder (cystitis) is very apt to occur in the course of the disease, when the urine becomes alkaline and very foul. Such inflammation often spreads upwards to the kidneys. Myelitis is always a serious disease, and frequently proves fatal.

Management. The patient must be kept at complete rest in bed, and a water-bed should, if possible, be procured. Local applications to the spine in the form of cold, heat, and counter-irritation have their advocates. Probably they are of little use, except early in the disease. Two points must be insisted on—namely, the necessity to guard in every possible way against the formation of bed-sores, and, in cases of retention of urine, to use every precaution for the thorough cleansing of catheters, both before and after use. A dirty catheter may cause the death of the patient. The liability to cystitis must never be lost sight of. Drugs are more often than not of little or no value, except to relieve symptoms, such as pain and restlessness, and to treat complications, as cystitis. When cystitis has occurred, the bladder is washed out with a mild antiseptic, such as boracic or quinine lotion. Nothing special about the diet requires mention. Plenty of nourishment is necessary. During convalescence tonics such as quinine and strychnine are prescribed, and electrical treatment and massage are applied to the wasted muscles.

Infantile paralysis. Infantile paralysis, so called from its liability to attack young children, results from an inflammation involving that part of the cord which is especially concerned in the nutrition of the muscles—namely, the anterior ends or "horns" of grey matter (see p. 48). The disease, as a rule, comes on suddenly, being ushered in by feverishness or pain in the part which eventually becomes paralysed. The paralysis is not usually detected for a day or two afterwards, when both the arm and leg or only one limb or part of a limb may be

found affected. Recovery is often only partial, and while one or two limbs may recover the other parts attacked may remain permanently paralysed.

Management. The importance of this disease to the nurse lies in the fact that a great deal depends for the result on her intelligently carrying out the treatment required. As soon as the fever has subsided, passive movements and massage of the affected part or parts must be undertaken. The limbs must be kept thoroughly warm by woollen stockings or by wrapping them up in cotton-wool. The child should be set in a chair or laid on a bed, and the paralysed limb rubbed from below upwards to the shoulder or hip twice daily for a quarter of an hour. To restore power to the limb the child should be made to push against the nurse with the hand or foot. Lastly, electricity and saline baths are prescribed with the same object. Strychnine, iron, and cod-liver oil are of value during convalescence.

As a result of infantile paralysis the development of a limb may be retarded or arrested from loss of nutrition, so that it may be an inch or more shorter than its fellow. In addition to such lack of development actual deformity may occur, affecting chiefly the hand and foot.

Locomotor ataxia. The only other disease of the spinal cord requiring mention is one to which we have already alluded under the heading of Inco ordination—namely, locomotor ataxia.

This is a chronic disease, characterised by a variety of symptoms, which at an early stage are often ill defined, but which later on become most pronounced. In addition to the inco-ordination, which is the principal feature of the fully developed disease, may be mentioned the following: a feeling as if a cord were tightly bound round the chest or limbs (girdle pain), sharp pains darting down the legs, failure of the pupil to contract when exposed to the light (loss of "light" reflex), loss of knee-jerk (patellar reflex), and periodic attacks of stomach disorder.

Treatment. The treatment is more often than not unsatisfactory. Drugs are sometimes of benefit, especially when the disease is caused by syphilis. Electricity is applied to the spine. Absolute rest is required, and careful nursing may sometimes accomplish much. Bed-sores must be carefully watched for, as nutrition is often at a low ebb. The catheter may have to be used regularly: in such a case great

cleanliness must be observed, and the bladder must not be allowed to become over-distended. Suspension of patients as practised by Dr. Charcot by means of a tripod and pulleys has met with some success in a few cases. Frenkel's method, whereby the muscles are trained to act harmoniously by a series of systematised exercises, has been more successful, and its *rationale* is better understood. The clothing must be warm; flannels should be worn next the skin. Finally, the patient must lead a regular, quiet, and healthy life.

Affections of the brain. (3) Affections of the brain. The first of these which requires mention is the disease known as meningitis, or inflammation of the membranes (meninges) which cover the brain. The same disease is occasionally also seen affecting the membranes of the spinal cord, when the term spinal is prefixed (spinal meningitis). Meningitis may be simple or tubercular in origin. The latter is by far the commoner, and to it alone we shall refer. The same agent is at work as we have seen elsewhere—namely, the tubercle bacillus. Little bodies (tubercles), varying in size from a minute speck to a pin's head, are deposited on the membranes, especially on the under surface of the brain. These, by their presence, set up inflammatory changes in the membranes. In addition to this there is an outpouring of fluid into the cavities of the brain (lateral ventricles), which presses upon the brain substance.

Meningitis.

Tubercular meningitis is essentially a disease of childhood, many of the cases occurring between the ages of two and six. The onset is gradual. At first there may be merely peevishness and loss of appetite, and the child will be found to be moody and disinclined to play. There are also apt to be loss of flesh and constipation. Sleep is probably disturbed, and the child may cry out in the night and grind the teeth. This stage may continue for days, weeks, or months. The next stage is marked by distinct signs of brain irritation, as is evidenced by a marked increase in the symptoms already mentioned, with headache, vomiting, apparently without cause, delirium, convulsions, squinting, dislike of light and sound, and moderate fever. Occasionally improvement may now occur, but more commonly the third and last stage follows, which is characterised by altered breathing (sometimes of the

Cheyne-Stokes type), feeble pulse, and gradually increasing loss of consciousness (coma), ending in death.

Diagnosis. The diagnosis of the disease is often difficult.

Treatment. Treatment is in most cases unsatisfactory. An ice-bag should be applied to the head, and the bowels should be freely opened: for this calomel in young children answers admirably. Counter-irritation applied to the back of the neck or the shaven scalp in the form of blisters or stimulating liniments is recommended by some. It is of doubtful value. The diet must consist principally of milk. The room should be kept darkened, and absolute quietness observed.

Hemiplegia Paralysis of one-half of the body is known as hemiplegia. It is caused by an injury to certain parts of the brain on the side opposite to the paralysis. Such an injury is most frequently due to hæmorrhage into the brain from the bursting of a blood-vessel, or to the blocking from one cause or another of an artery in the brain. The leg, arm, and face are the parts most commonly affected. The attack may be of long or short duration, and recovery may be complete or only partial. Certain of the muscles of the paralysed limb tend sooner or later to become rigid and contracted in many cases.

Apoplexy. As a result of hæmorrhage into the brain the patient may quickly lose consciousness and fall. Such a condition is known as apoplexy. More commonly, however, the symptoms come on more slowly. There may be warnings of an attack of apoplexy before its actual occurrence, such as loss of memory, altered speech, headache, and general irritability. Apoplexy is a disease more especially of advanced life, when the arteries in the brain are losing their elasticity.

History. The usual history of an apoplectic fit is as follows:—The patient complains of headache, and soon becomes unconscious, or he may simply fall with a cry: again, he may be found unconscious in bed or in the street. He cannot be roused; his breathing is noisy (stertorous) and slow, and the pulse is slow and full. He may die quickly or may remain unconscious for several days.

Treatment The patient should be kept lying down, where he has fallen if possible. His head and shoulders should be raised, and by placing him on one side the free action of the

uppermost lung is promoted and the stertor often relieved. Ice is to be applied to the head and a quickly acting purge given. As he is unconscious, the most suitable drug is croton oil. Two drops are placed on the back of the tongue, and are thus swallowed involuntarily. The bladder will require regular attention. Mustard may with advantage be applied to the back of the neck. The diet must be light and nutritious. When consciousness has returned, and it is evident that hæmorrhage has ceased, the results of such hæmorrhage, namely paralysis and other symptoms, are treated. The patient must lead a very quiet, regular life, and avoid all business as much as possible. The liability to a second attack has always to be borne in mind.

Intracranial tumour. A tumour may grow from the bones of the skull, from the membranes, or it may be situated in the brain itself. The symptoms to which it gives rise are divided into two groups—namely, those which it is customary to meet with in all cases, independently of its position, and those which are caused by its special situation (focal or localising symptoms). The former include pain in the head, which may be slight or very severe; vomiting, which has no relation to the taking of food; and inflammation of the optic nerve at the back of the eye, as discovered by the use of the ophthalmoscope—this may or may not interfere with sight. Among the localising symptoms are local paralyses, convulsions, and giddiness.

Management. The management of cases of intracranial tumour are in most cases unsatisfactory. It may be possible to influence them by drugs, or they may occasionally be amenable to surgical interference; but in most cases it is only possible to relieve the symptoms to which they give rise.

Abscess of the brain. Abscess of the brain (cerebral abscess) most commonly occurs as a result of disease of the ear spreading inwards to the skull. It may, however, occur in general blood-poisoning (pyæmia). The symptoms are generally obscure. When there is good reason to suspect an abscess of the brain, an operation is performed to reach and evacuate the pus. Apart from this it is only possible to treat the symptoms.

Epilepsy. Epilepsy is a chronic disease of the nervous system of a functional character, in which there are attacks of sudden loss of consciousness, with or without convulsions.

Causation. The disease is hereditary in about one-third of the cases. Injuries to the head, tumours of the brain, sudden fright, and certain fevers are among the conditions which may bring on the disease.

Varieties of epilepsy. There are two well-marked forms of epilepsy. The first, severe or major epilepsy, or, as it is commonly known, "haut mal," consists of the ordinary typical epileptic seizure. It is preceded in many cases by a warning (aura), of which there are many varieties. As examples of such may be mentioned pain in the limbs, head, and face, twitchings, tingling, changes in vision, peculiar smells and sounds. Then follows a sudden loss of consciousness, the patient perhaps falling suddenly to the ground. The face, often pale at first, soon becomes of a dusky hue. Breathing is temporarily suspended, and the muscles of the whole body are kept rigid. In about half a minute the respirations return, and the convulsions become clonic. There now comes to be a general muscular twitching, commencing usually in the face, and soon spreading to the rest of the body. The tongue may be bitten, and there is often frothing at the mouth. The patient is still quite unconscious, and urine and fæces may escape. In a few minutes the convulsions cease, and the patient passes from the comatose state into a condition of sleep or stupor, or the return to consciousness may be sudden.

The second form, mild or minor epilepsy, "petit mal," is characterised by sudden momentary unconsciousness, which may occur, for example, in the middle of talking. The attack merely lasts a few seconds. This form is, however, the more hopeless of the two as regards cure.

Epilepsy is not in itself usually a dangerous disease, except inasmuch as the patient may injure himself by falling into the fire or water or may choke during a fit. Rarely, however, there may be a series of fits, which last from several hours to one or even two days, during which there is complete unconsciousness. This condition, known as the "status epilepticus," is often fatal; the temperature may rise even as high as 107° F., and there may be profound collapse.

It will be for the doctor to satisfy himself that the convulsions are due to epilepsy, and not to other causes, such as malingering, hysteria, tumour of the brain, or

Bright's disease. It is by no means uncommon for a fit to be feigned, especially in order to excite sympathy. The malingerer chooses a suitable and safe spot in which to fall, and tries to excite attention. Indeed, it is on this account that he is often so frequently detected. He is generally very red in the face, froths very much at the mouth, and the eyelids close when the conjunctiva is touched. In the hysterical fit the patient generally moves about, while the epileptic keeps to one place. In the former the movements are more purposive than the latter, and the fit lasts much longer.

Management. The management of epilepsy includes that of the fits and that of the interval between them. The former we referred to when speaking of emergency cases (see p. 177). When there is a well-marked "aura," it may be possible to stop a fit by various means, depending upon the nature of the aura. The chief object in the intervals is to lessen the number of the fits, or, if possible, to prevent their return. A regular life as regards exercise, food, sleep, and the evacuation of the bowels must be insisted upon, and alcohol should be entirely abstained from.

By far the most valuable drugs are the bromides of potassium, sodium, and ammonium, especially the first named, which in most cases have a marked influence on the frequency and the severity of the fits. It is necessary to take them for a long period of time—for months, or it may be for years. Other drugs which are sometimes used with benefit are belladonna and zinc.

In epileptics false teeth should always be removed at night, and they should not, if possible, sleep alone.

Trephining the skull is sometimes called for where the cause of the fits can be localised to a particular spot, as is sometimes possible.

Chorea. Chorea, or St. Vitus's dance, is another functional disease of the nervous system. It is characterised by irregular, uncontrollable movements affecting different parts of the body, especially the face and limbs. **Causation.** It is closely related to rheumatic fever, for in more than one-third of the cases there is a rheumatic origin. Indeed, some authorities regard chorea as rheumatism of the brain. Both diseases give rise in many cases to endocarditis. Other causes include fright and various forms of irritation:

for example, the presence of worms in the intestine, and pregnancy.

The disease is more common in children, and lasts usually from six weeks to three months. An early symptom in children is irritability, and it is noticed that when the child is about to make a movement such movement is delayed, and things are apt to be dropped. A common feature of chorea is inability to keep still; the child is constantly fidgeting. In severe cases the patient may be unable to feed himself, and the movements may continue during sleep. Recovery is the rule, except in very severe cases, when death may occur from exhaustion or from sores produced by the constant friction.

Treatment. The treatment of chorea includes the removal of the cause when this is possible—as, for example, worms and the rheumatic poison. Secondly, the maintenance of absolute rest and absence of worry and excitement, with a nutritious diet. The child must on no account be exposed to ridicule. Thirdly, the use of drugs, the most valuable of which is undoubtedly arsenic. Zinc is sometimes prescribed, and various sedatives: for example, chloral, hemlock, and hyoscyamus. Other important measures are cold or tepid sponging, applied especially along the spine, gentle exercise, massage, and gymnastics to stimulate and train the muscles, and change of air. In severe cases it may be necessary to resort to nutrient enemata, and, when the patient is maniacal or delirious, to fix padded boards round the bed, and to obtain rest by inhalations of chloroform.

Hysteria. Lastly, the disease known to every nurse as hysteria must be briefly alluded to. And in the first place let it be noted that hysteria is a disease, and must be treated as such. It manifests itself in many different forms, causing increase, diminution, or perversion of one or more of the various functions of the nervous system. Various sensations, for example, may be complained of, or sensation may be lost altogether. And not only may the nervous system itself be affected, but through it the other systems of the body may be indirectly upset, producing such phenomena as a peculiar, noisy cough, vomiting, difficulty in micturition, and the passage of light-coloured urine in large quantity. We have seen that the hysterical "fit" may resemble at first sight the epileptic fit, and it is a feature of hysteria that

the symptoms of nearly every disease may be simulated by it.

In the management of the affection much tact is required. The nurse must be firm yet kind without being unduly sympathetic. The more the patient is watched, the worse she will probably be. Drugs and good feeding are of value, but we would lay especial stress on the value of moral treatment, which it is the especial province of the nurse to carry out. **Management.**

What is known as the Weir-Mitchell treatment, in which the patient is entirely isolated and attended to only by her nurse and doctor, has done much good. This treatment includes a generous dietary, complete rest, together with massage, and sometimes also electricity.

The name neurasthenia is given to a set of symptoms characterised especially by nervous exhaustion, for which isolation and complete rest are the most valuable remedies. **Neurasthenia.**

PART IV.

CHAPTER XXVIII.

ON CHILD-BIRTH, WITH SPECIAL RELATION TO THE CARE OF THE LYING-IN WOMAN AND THE NEWLY BORN CHILD.

ALTHOUGH the subject of child-birth is one that more especially concerns the monthly nurse, constituting as it does a special branch of nursing, yet it is advisable that nurses generally should acquaint themselves with its more important phenomena.

Again, the subjects of midwifery and gynæcology, a name by which we signify the diseases peculiar to women, are closely related; for although child-birth is an entirely normal or physiological process, yet it is constantly bordering on the abnormal, a fact which cannot be too strongly kept in mind. Many of the ailments to which women are subject are brought about or aggravated by mismanagement at the time of confinement. It is obvious, then, that we cannot disassociate the subjects of midwifery and gynæcology.

For their proper understanding a brief reference must be made to the anatomy and the physiology of the female reproductive organs. These are divided into the internal and the external. It is to the former that we need alone at present refer. They include the ovaries, the Fallopian tubes, the uterus, and the vagina.

Uterus. Let us take the uterus first. This is a hollow muscular organ, flattened from before backwards, and more or less triangular in shape, with its broad end directed upwards. It is situated in the cavity of the pelvis, between the bladder

and the rectum. It is divided into two parts: (1) the body, the upper expanded portion; and (2) the neck, or cervix, the lower narrow portion. The latter projects into the vagina, with which it communicates by an orifice known as the os uteri (mouth of the uterus). This, the lower opening of the uterus, enlarges, as we shall see, during labour, for the passage of the child and after-birth. The interior of the organ corresponds in shape with the exterior. The upper lateral angles are prolonged into the Fallopian tubes. The two surfaces of the uterus, anterior and posterior, are normally in contact.

We have been referring to the organ in its unimpregnated state—that is to say, when it is not the seat of a fertilised ovum. The impregnated uterus soon commences to enlarge, until at the end of three months it has ceased to remain a pelvic organ, and has begun to encroach on the abdominal cavity. It continues to enlarge until it reaches as high as the tip of the sternum, and fills the abdomen. It must be understood that the uterus is a movable organ. Its body is bent somewhat forwards on the cervix, and rests on the bladder. But as the bladder fills the uterus is gradually straightened, to resume its original position when the bladder is emptied. Apart from the influence of the bladder, however, the organ moves with every movement of the body, as in breathing, walking, etc.

Fallopian tubes. The Fallopian tubes run outwards from the lateral angles of the uterus, one on each side, towards the side walls of the pelvis. They end in fringed openings, which are in close relation with their respective ovary.

Ovaries. The ovaries are two little almond-shaped bodies lying above the fold of the groin, one on each side. The ovaries and Fallopian tubes are together known as the uterine appendages. The diagram (fig. 72) shows the brim or inlet of the pelvis in outline as it would appear seen from above. Just below the brim lies the uterus in the centre, with the appendages on either side.

Vagina. The vagina is the canal which connects the uterus with the external reproductive organs, collectively known as the vulva. In its front wall is placed the orifice of the urethra.

Ovulation. The function of the ovaries is to produce ova in their interior: these, when fertilised, represent the rudiments of a young fœtus (embryo). The ova are discharged periodically

into the Fallopian tubes, whence they are carried to the uterus.

Menstruation. This periodic discharge of ova is closely associated with a corresponding loss of blood from the lining membrane (endometrium) of the uterus, to which is applied the term menstruation. Commencing about the age of fifteen, menstruation recurs regularly in health every three or four weeks until the "change of life" (menopause) takes place. The flow is, however, in abeyance during preg-

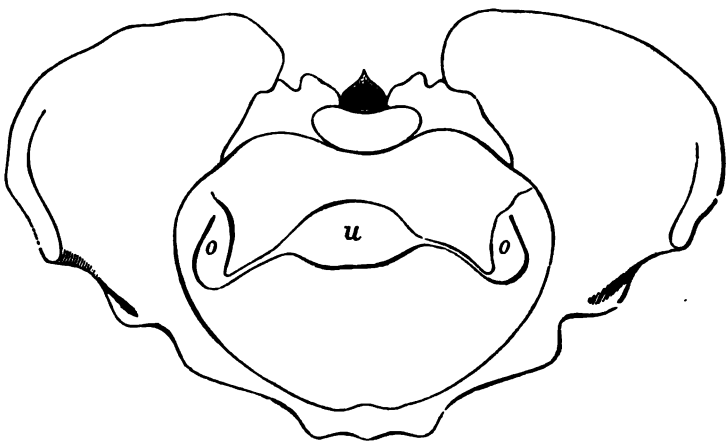


FIG. 72.—Diagram to show the position of the base (fundus) of the uterus, with the Fallopian tubes and ovaries on either side. The pelvis is represented in outline as seen from above and the bladder distended. (Hart and Barbour.)

o. o. Ovaries, right and left. *u.* Uterus.

nancy and nursing (lactation), save in certain exceptional cases.

Development of the fertilised ovum. When the ovum has become impregnated or fertilised, it commences to develop in the cavity of the uterus. We say that the woman has conceived and has become pregnant.

Duration of pregnancy. For the complete development of the fœtus a period of forty weeks is necessary, and it is customary to calculate the duration of pregnancy from the last day of the last

menstrual period. A convenient method of making this calculation is to add a week to this date, and to go back three months in the calendar. An example will illustrate this:—Last day of last menstruation, January 10th; add seven days, and we get January 17th. Working backwards three months, we obtain October 17th as the probable date of confinement. It is almost needless to say, however, that this is only approximate, and it is best to allow a margin of several days on either side.

Symptoms of pregnancy. It will only be necessary to mention a few of the symptoms of pregnancy, in addition to those already referred to—namely, the progressive enlargement of the uterus and the cessation of the menstrual flow.

Morning sickness. One of the commonest of these is morning sickness, and it usually occurs during the second and third months, but may come on sooner or continue longer. As a rule the sickness is not accompanied by nausea, and gives rise to little trouble. If the health is interfered with, a doctor should always be consulted. A carefully regulated diet is generally all that is necessary.

Changes in the breasts. The breasts undergo important changes when a woman becomes pregnant, and these changes are more marked in a first pregnancy. Enlargement takes place, milk may be secreted, and the area around the nipple (areola) becomes darker in colour and increases in size.

In addition to the maternal symptoms there are certain signs dependent on the presence of the fœtus. Some women reckon the date of their confinement from the time when they are first conscious of the movements of the fœtus. This, which is known as the quickening, is usually experienced about half-way through pregnancy—that is to say, from four and a half to five months after conception. **Quickening.**

Fœtal heart-sounds. Lastly, the sounds of the fœtal heart are heard with more or less distinctness during the latter half of pregnancy. They are generally best heard at a spot midway between the navel and the left groin.

Complications of pregnancy. The complications of pregnancy are various. They may depend on previous disease, such as phthisis, heart disease, or one of the specific fevers; or the disease may affect the uterus itself, leading perhaps to the termination of pregnancy by the expulsion of the fœtus before it is fully

developed. Such an occurrence, happening before the child is able to live apart from its mother—that is to say, before the sixth or seventh month (calculating the duration of pregnancy as nine calendar months)—is known as abortion or miscarriage; after this period it is referred to as premature birth.

Abortion and premature birth.

Development of the ovum outside of the uterus. Development of the ovum may take place outside of the uterus, either in the Fallopian tube or in the abdominal cavity. This is a very serious condition, and requires prompt surgical interference in order to save life.

Bladder and rectal disturbances. Bladder troubles are not uncommon during the course of pregnancy. There may be retention of urine or incontinence from pressure on the organ or the urethra by the enlarging uterus. The rectum may be affected in a similar way, giving rise either to constipation or diarrhœa.

Attachment of the fœtus to the uterine wall. The fœtus is attached to the uterine wall by means of the umbilical cord (funis) and the placenta, and thereby obtains its nourishment from the mother. It lies in a sac, **The amnion.** called the amnion, surrounded by a fluid (liquor amnii), which acts as a water-bed and facilitates its movements.

In spite of the various symptoms of pregnancy, none can be said to be, occurring singly, absolutely corroborative. The diagnosis must rest on the occurrence of most of the signs of pregnancy, and it may be said that there is sometimes much difficulty in coming to a definite conclusion, especially in the earlier months.

Phenomena of labour. We must now turn to the phenomena of labour. In every labour three factors have to be considered—namely, the powers at work, the passages through which the fœtus passes, and the products.

The three factors of labour. The first factor includes the uterus and the powerful muscles of the thorax and abdomen. The second consists of the soft parts—namely, the lower part of the uterus, the vagina, and vulva; and the hard part—namely, the bony canal of the pelvis. Included in the third factor are the fœtus, the amniotic fluid, and the after-birth (the umbilical cord and the placenta).

For a natural labour we require the harmonious action or balancing of these three factors.

Definition of a natural labour. We shall in the first place speak of natural labour: this may be defined as one in which the head can be felt occupying the mouth of the uterus (os uteri), and which

is completed without any complication within twenty-four hours.

Preliminary symptoms of labour. Before the actual onset of labour there are certain preliminary symptoms. One of these, which is experienced for a week or more previously, is an increased freedom of breathing and a diminution of size, owing to the uterus sinking down into the pelvis. At the same time this also tends to cause pressure on the rectum and bladder. An early symptom of labour before the actual onset of the pains is a discharge, usually of slightly blood-stained mucus, from the vagina. This is known as "the shows."

The three stages of labour. True labour is divided into three stages. The first stage commences with the onset of the pains, and ends with the complete dilatation of the os uteri; the second stage commences with the end of the first, and ends with the expulsion of the child; while the third stage has to do with the separation of the placenta from the uterine wall and its expulsion. The first stage is by far the longest, being three or four times as long as the second.

Uterine contractions or pains. The uterine contractions are spoken of as "pains." But it should be borne in mind that the contractions only become really painful when labour is in progress, and occasionally there may be little or no pain throughout the labour.

True and false pains: their differentiation. Again, it is of even greater importance to remember that the pains may not be true labour pains at all, but may be due to other causes: for example, a loaded bowel, retention of urine, or excessive exertion. True pains are regular in character, and become stronger and more frequent as labour proceeds, whereas false pains are more irregular. The former start in the back, and work round to the front of the body; while the latter are referred more directly to the abdomen, sometimes to one particular spot. With true pains the contractions of the uterus may be felt when the hand is placed over the organ.

The relief of false pains. In relieving false pains we first endeavour to empty the bowel and the bladder (using the catheter if necessary). If they still continue, sedative treatment will be called for. For this purpose opium or morphia is often prescribed. The patient must be kept at absolute rest.

Effect of the uterine contractions. It will be noticed that labour pains are not continuous, and thus rest is afforded to the mother, and pressure on

the viscera is relieved. The effect of these pains is to gradually open up the mouth of the uterus. If we were to examine the patient towards the end of this stage during a pain, we should feel a tense membrane filled with fluid bulging through the mouth of the uterus. This is the bag of membranes, and consists of that part of the membranes which covers the child's head, filled with some of the fluid which is now shut off by the head from the rest in the amniotic sac. This bag acts as a fluid wedge in stretching the mouth of the womb. The next event is the bursting of this bag, with the discharge of the fluid: this is usually coincident with the full dilatation of the os uteri.

Formation of the bag of membranes.

Bursting of the bag of membranes and complete dilatation of the os uteri.

Second stage.

Now the first stage is completed, and the head of the child can easily be felt projecting through the os. The cavities of the uterus and the vagina are now practically one canal. The head descends into the pelvis, the contractions of the uterus become stronger and stronger, and force the head onwards until it lies just inside the vaginal orifice. The perineum is very much stretched now. With each pain an advance of the head takes place until it is eventually born. After a rest of longer or shorter duration the birth of the child is completed, and the second stage is over.

Birth of the head.

Third stage: separation and expulsion of the placenta.

The uterus now contracts upon the placenta, which is separated, and, passing down into the vagina, is expelled by the aid of the abdominal muscles.

Puerperium.

Labour is now completed, and the patient enters on the puerperal state (puerperium).

Contraction of the uterus.

The uterus shrinks into a large firm ball, which can be felt above the pubes. It goes on contracting till it returns entirely to the pelvis, but does not regain its normal size for six weeks or more.

After-pains.

For some hours after labour the patient experiences more or less pain from the contractions of the uterus. These are called the after-pains.

Lochia.

There is a discharge lasting for from two to three weeks after labour from the uterus. This is the lochia. At first consisting of pure blood and free in quantity, it soon diminishes and becomes more watery. It must be observed that the lochia should be perfectly sweet.

Appearance of milk in the breasts.

Milk appears in the breasts usually on the third or fourth day, sometimes earlier, sometimes later.

Before speaking of the management of labour, brief

reference must be made to unnatural labours. These may be due to causes on the part of the mother or the child. Labour is thus often protracted, and may require to be terminated by forceps or other instrumental means. The buttocks, the face, or the shoulder may "present" instead of the top of the head (vertex). Lastly, there is an important class of unnatural labours known as complex, which include the various forms of hæmorrhage from the uterus, convulsions (eclampsia), tearing of the uterus, and plural births. **Unnatural labour.**

It should be distinctly understood from the outset that a nurse must on no account undertake or attempt to carry through by herself any labour which is not perfectly natural in all its features.

The management of labour includes the preparation of the patient, the chamber and all requirements before its commencement, attendance on the patient during labour, and the management of both mother and child during the puerperium. It will be well if the nurse be in the house for a few days before labour commences. She will thus get accustomed to her patient and be better able to help her during her confinement. Needless to say, however, the nurse is often not summoned until labour has actually commenced, and she may not arrive till all is over. She must come suitably provided with the usual requisites, and must answer the call with the least possible delay. **The management of labour.**

It is best for the monthly nurse not to undertake general nursing, as she thereby renders herself liable to infection, and may carry it into the lying-in room.

The requisites for a confinement may be divided into those to be provided by the doctor, by the nurse, and by the expectant mother. As we are only concerned with a natural labour, it is to the two latter necessaries that we need alone refer. **Requisites for a confinement.**

The nurse should bring with her the following:— **Nurse's necessaries.**

Clinical thermometer.

A pot of carbolised vaseline or petroleum jelly.

A No. 10 male gum elastic catheter.

A Higginson's syringe with a vaginal tube.

Scissors.

Some antiseptic, either in the form of tabloids or in solution. A convenient form will be found to be Burroughs

& Wellcome's tabloids of perchloride of mercury, of such a strength that one added to a pint of water makes a solution of 1-5000.

A nail-brush.

Mother's requirements: those of the child. The requirements for mother and child should be prepared in good time. A convenient plan is for the mother to make a list, which she may submit to the nurse.

For the child should be provided an old blanket, several pieces of soft old linen, thread or tape for the cord, a soft sponge, Fuller's earth, a large supply of diapers of various sizes, flannel binders from eight to ten inches wide, flannel shirts and petticoats, and several large and small nickel-plated safety-pins.

The mother will require a mackintosh sheet, several diapers, absorbent wool, a stiff binder, safety-pins, night-gowns, and flannel wrappers.

There should also be provided clean towels, a bed-pan, and, at the commencement of labour, plenty of hot water.

The above list cannot aim at being complete, and many additions may be made to it to promote the comfort of the patient.

Reference may here be made to the obstetric outfits which are now on the market. These are sometimes very convenient. They are put up in cases of one guinea and half a guinea. The sheets and diapers are composed of wood-wool, which is soft, absorbent, and cleanly; after use they are simply burnt. They are manufactured by the Sanitary Wood-Wool Company, 26, Thavie's Inn, Holborn Circus, London, E.C.

Lying-in room. The room should be bright and airy, with a minimum of furniture. It should not be in close proximity to a water-closet or open sink.

Bed and bedding. There should be free access to the bed, which may be arranged on some such plan as the following:—A mattress guarded by waterproof sheeting, a sheet, then another sheet of waterproof, next a folded-up sheet under the buttocks; and covering the patient, a sheet, one pair of blankets, and a counterpane, with, if necessary, a quilt in addition.

Preparation of the patient. The patient must be kept as cheerful as possible. At the commencement of labour the bowels should be freely moved by a simple enema, if they have not recently acted. The bladder should likewise be emptied. If this cannot

be done voluntarily, it will be necessary to pass the catheter. It is best to expose the patient in order to do this, and to be careful that the catheter be thoroughly clean. If it be allowed to slip into the vagina by mistake, it must be again washed before it be passed, otherwise inflammation of the bladder may be set up.

Next, give a douche of warm perchloride lotion (1-5000), and wash the external genitals.

The nightdress should be rolled up to the arm-pits and pinned there. The patient should wear a warm flannel wrap and a petticoat which can be easily removed after labour. The hair should be brushed and plaited.

Management of the first stage.

The first stage generally occupies from four to six hours or longer. It is much longer in first cases (primiparæ). During this time it is best to allow the patient to walk about, since this promotes the action of the uterus. Stimulants must on no account be given, but light food is allowed. When a pain comes on, the patient should lean over a chair.

We are supposing that the nurse be conducting the case alone, although we are strongly of opinion that, whenever possible, every midwifery case should be under direct medical supervision, since, at any period in its progress, a complication may ensue, requiring special knowledge for its successful management.

Vaginal examination.

Early in the case a vaginal examination must be made, the patient lying on her left side, with the knees drawn up. The nurse must first thoroughly wash and scrub her hands with a nail-brush, paying special attention to the nails, and then dip them in perchloride of mercury solution (1-1000). This procedure must be rigorously carried out before every vaginal examination. The importance of asepsis in the conduction of labour cannot be over-estimated.

During an interval between the pains the finger is introduced into the vagina, passing it from behind forwards until the vaginal orifice is reached. The vagina is felt to be hot and moist, and, passing upwards and backwards, the os uteri is encountered. If the os be sufficiently dilated, the membranes may be felt, and behind them the presenting part; the top of the head (vertex). As soon as a pain comes on the membranes become tense and bulge through the os uteri. Care must be taken not to rupture the

membranes at this stage; in fact, the nurse should not attempt to rupture them, even when she believes the os to be fully dilated. It is better to let them burst of their own accord.

Caution. Two points must be kept in mind during this stage: first, not to let the patient bear down, as this simply exhausts her; and, secondly, not to examine too frequently.

Condition of the os uteri. The condition of the os uteri should be noted—whether open or closed, and if the former, the degree of dilatation: we are accustomed, for example, to speak of the os as being of the size of a shilling or a crown-piece. Again, the consistence must be observed—whether it be thick, soft, and moist, or thin, hard, and dry: in the latter case it is spoken of as rigid, and this condition is a frequent cause of delayed (lingering) labour. Too frequent examination is very apt to cause rigidity of the os.

When once she is satisfied that labour is in progress, the nurse must be prepared to answer two questions. The first is, "Is everything all right." Now, if the head can be felt presenting, and everything appears perfectly natural, she can answer confidently; if, on the other hand, there is the slightest doubt in her mind, she should inform the friends (not the patient), and be prepared to summon medical assistance; especially is this necessary if any other part than the head be felt presenting, when no delay must take place in getting further advice.

The second question is, "How long will it be?" Now it is a very rash thing to state at all precisely how long a labour will be at this stage, and the best answer to this question is to say that it depends on the pains and on the patient's own efforts.

Management of the second stage. As soon as the pains become more severe and work round more especially to the front, the patient should be placed in bed, ready to await the bursting of the bag of membranes. Now the second stage has commenced, and the head passes through the os. Examinations must be made more frequently at this time,—first, to feel that the cord has not been pushed down with the head; and, secondly, to note the progress of the head through the pelvis. If the cord have fallen down, efforts must be made to push it up between the pains, otherwise the fœtal circulation may be arrested.

The fœtal head. A few remarks may be made here about the child's head. The bones are soft, and are able to glide to some extent one over the other, owing to their being united by membrane. Over the front part of the head is a space covered in by membrane. It has four corners, and is known as the anterior fontanelle. It is not replaced by bone until eighteen months after birth. At the back part of the head is a triangular ridge of bone, the posterior fontanelle. These can generally be recognised at this stage.

Anterior and posterior fontanelles.

The patient now uses her abdominal muscles, and bears down to expel the child. Now the back is complained of, and the nurse should support it with each pain. Cramps in the legs are not uncommon too, and must be relieved by rubbing. A roller-towel should be fixed to the end of the bed, to help the patient in her expulsive efforts. An ironing-board may also be placed at the foot of the bed, to give a purchase for the feet in pulling. A pillow should be doubled up and placed between the thighs when the head comes to rest on the perineum.

Care of the perineum. As the perineum becomes more and more stretched, the head gradually appearing at the vulva with each pain and receding during the intervals, care must be taken to prevent any laceration, and this is done by seeing that the head is not born too quickly, and its progress, if necessary, restrained. Where the pains are very strong, and especially in a primipara, the perineum should be supported with a soft napkin, and the head pushed forwards and somewhat upwards.

As soon as the head is born the nurse must see if the cord is round the neck; if this is the case, a loop must be pulled down and slipped over the child's head; if the cord is too short to allow of this being done, then it will be necessary to cut it and tie the two ends.

Care must be taken not to allow the shoulders to be born too quickly: usually there is a pause of a minute or two after the head is born.

After birth the child should be laid down near the mother. The contact of the body with the external air will cause it to inspire and cry. If inspiration do not occur, the mouth must be thoroughly wiped out; if this does not succeed, dip the end of a towel in cold water,

and slap the chest and back. The cord is not usually tied until the child is breathing well; if necessary, artificial respiration must be performed (see chapter xviii.).

The cord is now tied in two places, two inches and three inches respectively from the child's abdomen, and cut between these points. The child is then wrapped in a warm blanket and laid aside or given to an attendant.

Third stage: management of. The uterus, which should have been held immediately after birth, is now pressed upon, with the view of causing separation and expulsion of the placenta. The possibility of another child must not be lost sight of. This would be discovered immediately after birth of the first, on placing the hand on the uterus.

The duration of the third stage varies from a few minutes to half an hour or more. The patient should be allowed to rest a few minutes, and then she should be asked to make a few expulsive efforts, pressure downwards being made on the uterus through the abdominal wall. As soon as the uterus becomes firm and hard like a cricket-ball, it may be taken that the placenta has become separated from its interior and is now lying in the vagina, and bearing-down efforts on the part of the patient will serve to expel it. Traction on the cord should always be avoided. As it is being delivered it should be supported and slowly twisted round and round, so that it is preserved entire, and no portion of it is retained. To make sure of this, it must be examined subsequently, and is then best burnt.

After-management. Now the uterus is kneaded to promote its contraction, and it should not be left hold of until it is quite hard. The external genitals are bathed, and a warm, clean diaper applied. Medical opinion is divided upon the question of giving a vaginal douche immediately after a natural labour. Probably the nurse will be acting most wisely if she gives a warm perchloride vaginal douche as soon as the uterus is firmly contracted, as an antiseptic precaution. All soiled linen and other articles are removed from the bed and the room as soon as possible, and the binder is applied and tightly pinned. This should come down below the hips, and underneath it, just over the uterus, is placed a folded-up napkin in the form of a triangle, to keep up pressure on the organ and to fix it.

The patient should be made perfectly dry and clean, the diaper being changed in a quarter of an hour or twenty minutes and at short intervals, according to the quantity of blood escaping, for the first twenty-four hours. The loss should never be very profuse in a normal case, although some women lose much more than others. If the uterus be hard and well contracted, little fear of hæmorrhage need be entertained. Instead of diapers many prefer pads of absorbent or wood-wool. These are certainly more cleanly, and can be burnt when removed.

It is now especially that the nurse must be most particular in her antiseptics. She must regard the puerperal uterus as an open wound, and treat it as such. Before changing the diaper or pad she should first thoroughly rinse her hands in perchloride lotion.

The pulse should next be taken and recorded. If it be over a hundred, the occurrence of hæmorrhage or other complication must be watched for. Now the mother may be left to rest for a few hours, and attention given to the child.

The nurse's duties when a doctor conducts the case.

Up to this point, if the doctor have conducted the case, the nurse will have worked under him, giving him every help in her power. She will be prepared to aid him in any procedure he may decide to adopt: for example, the application of forceps, the arrest of hæmorrhage, etc. If forceps are to be used, she should place the instruments in an ewer of warm water, and before handing them to the doctor she should grease the blades with carbolised vaseline. She will, after the doctor's departure, take charge of the case and carefully carry out his directions. It is the attendance on the mother and child during the puerperium that constitutes that part of midwifery which belongs more especially to the nurse.

Attendance on the child.

It is presumed that the child is breathing well, and that its heart is beating properly. These points having been seen to, the eyes must next receive attention. It is most important that the eyes be thoroughly cleansed, especially in those cases in which the mother has suffered from a discharge (leucorrhœa) before labour. For this warm boracic lotion or boiled water may be applied by means of absorbent wool. Where there has been a purulent discharge (and this applies more especially to hospital practice),

Care of the eyes.

two or three drops of a 2 per cent. solution of nitrate of silver should then be dropped into the eye with a glass rod or eye-dropper.

Importance of warmth to the newly born child. It must be remembered that the newly born child requires much warmth and is very susceptible to cold; and especially is this the case in delicate and premature children. For such it may be necessary to use an incubator, to keep up a fixed temperature until the child has sufficient vitality to breathe the ordinary air.

The bath. The body is covered after birth with a whitish material, known as the vernix caseosa. To remove this, first oil the body, and then give a warm bath, the temperature of the water being 100° F. If the child is too feeble to stand this, it must be simply wiped with a soft towel. After the bath the body must be thoroughly dried and dusted where skin-surfaces come in contact: for example, the axilla and the groin. Next an examination must be made for any injuries received during birth, and any deformity or abnormality, as hare-lip, cleft-palate, imperforate anus or urethra.

Management of the cord. The cord should be powdered with boric acid, subnitrate of bismuth, or a mixture of salicylic acid one part, and starch nineteen parts. It is then to be wrapped up in absorbent wool or lint and kept dry, being disturbed as little as possible until it falls off. This usually happens on the fifth day, but it may occur earlier or be delayed for a fortnight. Some prefer not to give the full bath until the cord has completely separated. The stump should be powdered, and a pad of soft lint or muslin applied, and kept in position for about a month, to prevent umbilical hernia. Bleeding from the stump must always be regarded as a serious occurrence, and requires medical advice.

Clothing. As soon as the cord has been dressed the flannel binder is applied firmly, but not too tightly, and the remainder of the clothing in order. The three points to observe in clothing the infant are warmth, lightness, and looseness.

Feeding. Next comes the question of feeding. The methods are three—namely, breast-feeding either by the mother or wet nurse, artificial feeding, and a combination of both. To decide which method to adopt requires a consideration of the mother's health and the conditions of the infant. The first method must always have preference, unless there is some special reason against it, as this is the natural food.

I. It is best not to apply the child to the breast for a few hours, especially in primiparæ, as the child may be disappointed if there is no milk, and may refuse to take the breast later on. Where, however, the uterus is not contracting well, and it is desired to stimulate it, the child should be put to the breast as soon as it has been washed and dressed, as this has a good effect on the womb. The milk secreted for the first few days has received a special name—colostrum. It has a deep yellow colour, is richer in nitrogenous material than the later milk, and is not so sweet. Moreover, it has a slightly purgative effect on the child, thus removing from the bowels the darkish-brown material (meconium) which they contain at birth. **Breast-feeding.**

It is most important that regularity be observed in nursing, as the child is thus early trained to good habits and the mother is not unduly disturbed. The child should be nursed once every six hours on the first day, once every four hours on the second day. On and after the third day for the first month ten nursings in the twenty-four hours should be allowed and no more. The child should be awakened during the day at regular intervals, but at night it should be allowed to sleep, two nursings being given between the hours of 9 p.m. and 8 a.m. In a few weeks a child can thus be trained to sleep for five or six hours or longer at night, and to take the breast with regularity. Needless to say, this cannot always be accomplished, but the nurse must aim at obtaining this result in every case of breast-feeding.

After each nursing the nipples and breasts should be washed with warm water and kept thoroughly clean. The child must not be allowed to fall asleep on its mother's breast. When the breasts are full and much swollen, they should be gently rubbed from the circumference towards the nipple. If there is too much milk in the breasts, it must be removed with a breast-pump, as otherwise signs of fever and constitutional disturbance may supervene. Again, a breast-pump may be required where the nipples are shrunken and cannot be drawn out. If there is cracking or eczema of the nipples, a shield will be necessary.

It must be remembered that in most cases there is a slight amount of fever about the third day, with the

advent of the milk. If this be not borne in mind, a rise of temperature may cause anxiety. This soon tends to disappear. If for any reason the mother is not to nurse, it will generally be necessary to stop the secretion of milk. The drug which is used for this purpose is belladonna: it is sometimes given internally, but is more often applied to the breasts as a plaster or an ointment. It may be sufficient merely to make pressure on the breasts with pads of wool and bandages.

Briefly, the contra-indications to nursing are (1) delicate health, (2) tuberculosis of the lungs or any other part of the body, (3) other serious bodily disease, (4) dangerous complications of labour such as convulsions or hæmorrhage, (5) those cases where there has been inability to nurse even under suitable conditions after previous confinements, and (6) absence of milk.

Weaning. The usual time to stop nursing and wean the infant is at nine months, but many mothers continue nursing for a year or more. A safe rule is to consider the child's weight. If at this period the weight remains stationary or advances very slowly, it is certainly an indication to commence weaning. Again, the mother's health is an important element. Many women cannot nurse after six months without their health failing. Weaning should be performed gradually, and, if possible, when the weather is neither very hot nor very cold.

If it be decided that the mother is not to nurse her baby, the question arises, Are the services of a wet nurse to be requisitioned, or is artificial feeding to be employed? In the first place it is to be understood that, even when it is decided to bring up the child by hand, it is always advisable to put it to the breast for the first two or three days of life, to aid the uterus to contract and to remove the colostrum.

Wet-nursing. Now wet-nursing has many objections, but in a certain small number of cases it is not only valuable, but even necessary, if the child is to be reared. An eminent authority affirms that of one hundred children who cannot be nursed by their mother ninety will thrive on artificial feeding, whereas the remaining ten will require a wet nurse, these latter including prematurely born infants and those living in large cities.

This method of rearing children is, however, never likely to become at all popular with us, and is seldom considered, except when other means prove inefficient. If a wet nurse is required, we must see to it that a suitable person is procured; and this is often a difficult matter. She must be a perfectly healthy respectable woman, with plenty of milk, and her child should be about the same age as that whom she is to nurse, or the milk is apt to disagree. A wet nurse must not live too well, otherwise her milk will contain too much fat, and will become deteriorated. A good plain simple diet is all that is required, and will be found to answer best.

Artificial feeding. II. We next pass to artificial feeding. The first point to bear in mind in bringing up a child by hand is to make the milk used approximate as nearly as possible to human milk. In spite of the large number of infant foods now on the market, it may safely be said that for the vast majority of hand-fed infants cow's milk, properly prepared, is by far the best. Many of these artificial foods contain an excess of carbohydrates, especially starch, which is not only of no value, but is often harmful, and accounts for many cases of illness in early life.

Cow's milk is richer than human milk in nitrogenous elements, and contains less sugar; therefore it requires to be diluted with water and to have sugar added. At first two parts of water to one of milk will be needed, but soon equal parts may be used. It will be advisable, however, not to give pure milk until the child is six months old, although no hard-and-fast rule can be laid down in this respect. The water used to dilute the milk must invariably be boiled, and this applies also to the milk itself, unless its source be absolutely reliable. A little cream may with advantage be added to the prepared milk, unless it be already very rich.

It is best to use sugar of milk and not cane sugar for adding to the milk, since the former is that which occurs naturally in milk. A good plan is to take a box holding exactly one ounce of sugar of milk, dissolve the sugar in a pint of boiling water, and add one part of this to every part of milk used.

Feeding infants. The following table, drawn up by Dr. Holt, will prove useful as a guide for the feeding of infants during the first year:—

SCHEDULE FOR FEEDING HEALTHY INFANTS DURING FIRST YEAR. (HOLT'S "DISEASES OF INFANCY AND CHILDHOOD.")

AGE.	No. of feedings in 24 hours.	Interval between meals by day.	Night feedings, 10 p.m. to 7 a.m.	Quantity for one feeding.	Quantity for 24 hours.
3rd to 7th day	10	*Hours.* 2	2	*Ounces.* 1–1½	*Ounces.* 10–15
2nd and 3rd weeks	10	2	2	1½–3	15–30
4th and 5th weeks	9	2	1	2½–3½	22–32
6th week to 3rd month	8	2½	1	3–4½	24–36
3rd to 5th month	7	3	1	4–5½	28–38
5th to 9th month	6	3	0	5½–7	33–42
9th to 12th month	5	3½	0	7½–9	37–45

Feeding-bottles. The food should be given at a temperature of 98°. The nurse must pay especial attention to the cleanliness of the feeding-bottles and tubes. And here we must enter a strong protest against the type of feeding-bottle in common use, which has a glass tube passing down to the bottom, and a rubber tube connecting the bottle with the teat. Now there is no fault to find with the bottle, which can be easily kept clean. It is the tubes which cause the trouble; they are hard to clean, and germs are very apt to congregate in them; these, when taken into the stomach with the milk, multiply under the favourable conditions of warmth found there, and set up fermentative changes in the milk, which give rise to the diarrhœa one so often encounters in young infants. The best kind of feeding-bottle is a more or less cylindrical one, with a wide mouth, over which is slipped a plain rubber teat. There is nothing complicated about this, and nothing which cannot be

easily kept scrupulously clean. If the bottle be graduated, it will be an advantage. At least two bottles and teats should be in regular use. To clean bottles rinse them in cold water, and then wash with soap and hot water, and a brush kept for the purpose. Teats should be well soaked in borax or Condy's fluid. Before using a bottle let it lie for several minutes in boiling water.

The following rules for the artificial feeding of infants should be observed :—

(1) Not more than twenty minutes should be allowed for one feeding.

(2) Never let the child go to sleep with the teat in its mouth.

(3) Attend to regularity in giving food.

(4) Hold the child in the arms while feeding, when possible.

(5) Do not warm milk up a second time for a subsequent feeding.

III. Mixed feeding denotes a combination of breast and artificial feeding. This is often practised when the mother's milk is good but not sufficient, and when it is desired to relieve her of part of her nursing, especially at night-time.

Management of the mother during the puerperium

The mother requires careful nursing during the puerperium. She must be kept in bed at least ten days, and often for a fortnight, especially if there have been any complication. We presume that the case has hitherto been satisfactory. The nurse had better not give a daily douching, when the doctor has charge of the case, without first consulting him. When she has to act on her own responsibility, she may give a vaginal douche of perchloride of mercury (1-5000) every morning for the first ten days. The patient should be sponged all over every day and kept thoroughly clean. The room, too, should be kept fresh and sweet. The diet will consist of slops for the first three or four days. On the morning of the third or fourth day an aperient should be given, preferably castor oil, or else a copious enema. The oil may be given in milk; but a better way is to proceed as follows :—Rinse a tumbler, and while it is still wet pour into it a little water; next put in the oil, from one to two tablespoonfuls, and on the top a little brandy. The oil remains sandwiched between the water below and the brandy above, and can be swallowed without being tasted. After the bowels have

been moved more substantial food may be given, and the usual diet gradually returned to.

The pulse and temperature should be recorded night and morning.

No visitors should be allowed for the first few days, and then only immediate relatives.

The binder is to be tightened regularly, at first two or three times a day, so as to keep up a regular and even pressure on the involuting uterus.

During the first forty-eight hours the after-pains are often troublesome, and the doctor may require to give opium for their relief. We try to avoid the use of drugs, however, as much as possible.

The same management is necessary after an abortion or miscarriage as after a full-time labour. People are apt to look on a miscarriage as a very trivial affair, and the nurse must do her best to disabuse her patient's mind of this idea. She must always be careful to see that everything has come away and nothing is left in the uterus.

Some complications of labour and of the puerperium.

Some of the complications of labour and the puerperium must now be considered, as they will influence materially the course of the puerperium. The first of these is hæmorrhage from the uterus. This is always serious, sometimes alarming, and the nurse must be prompt in dealing with it when she is alone.

Hæmorrhage from the uterus: its varieties.

Hæmorrhage may occur during the last months of pregnancy, during the three stages of labour, immediately after labour is completed, and finally not for some considerable time, perhaps forty-eighty hours, after labour. It is in cases of hæmorrhage after labour that the nurse will more especially be called upon to act on her own account, since the doctor may not be at once available, and prompt action is always necessary. Uterine hæmorrhage occurring late in pregnancy and during the first stage of labour is divided into two divisions, and depends on separation of the placenta from the uterine wall. When such separation is due to an original faulty implantation of the placenta, the hæmorrhage is "inevitable"; when the placenta is normally situated, but has accidentally become separated, the hæmorrhage is known as "accidental." Normally, the placenta is engrafted on the upper part of the uterus, but in the first-named case it is attached to the uterus in its

Inevitable hæmorrhage.

Accidental hæmorrhage.

lower part, and, lying more or less closely related to the os uteri, it blocks the passage, and with the progress of labour is inevitably separated, if it have not become so before labour has actually commenced.

Hæmorrhage during the second and third stages. Hæmorrhage during the second stage is generally due to laceration of the canals; in the third stage it has to do with the placenta being retained where the uterus has become tired out, or, as we say, inert, very frequently as a result of mismanagement in the earlier stages.

"Post-partum" hæmorrhage. Hæmorrhage occurring within an hour of labour is called "post-partum" hæmorrhage; after this period it is known as "secondary." For all practical purposes there are three kinds of hæmorrhage to remember—namely, inevitable, accidental, and post-partum, the last named of which depends on inability of the uterus to contract or to remain contracted. The symptoms of hæmorrhage need not here be dwelt upon; for the nurse is already acquainted with them. What is of more importance, especially in post-partum hæmorrhage, is to be able to recognise its indications.

Indications of hæmorrhage. These are general and local: the former consist of sudden pallor, rapid feeble pulse and respirations, a feeling of sickness and faintness, perhaps amounting to actual fainting, with coldness of the limbs; the latter are those relating to the condition of the uterus after labour, and refer only to post-partum hæmorrhage. The womb is felt to be soft and flabby, instead of at once contracting, and becoming quite hard like a cricket-ball; indeed, it may be felt to be gradually increasing in size, a sign which always gives rise to anxiety.

The first sign of inevitable hæmorrhage may be a loss of blood, in larger or smaller amount, occurring before or at the commencement of labour; and this often takes place without any warning, while the patient is lying quietly in bed, perhaps asleep.

When labour is in progress, we may distinguish between inevitable and accidental hæmorrhage by the following sign: in the former, the hæmorrhage continues during the pains, whereas in the latter it is arrested.

In these cases, if the nurse be present, she should at once send for the doctor, and unless the hæmorrhage be smart she had better not interfere; if, however, interference be necessary, she had better plug the vagina firmly with absorbent wool.

Internal hæmorrhage. Remember that during labour the hæmorrhage may be entirely internal, there being no external loss of blood at all. In these cases the bleeding takes place into the cavity of the uterus, the pains usually cease, and a sudden feeling of distension occurs, with all the symptoms of hæmorrhage. Under these circumstances packing the vagina would be of no use, and all that can be done is to summon the nearest doctor as quickly as possible. It is better not to use stimulants, since they are apt to increase the hæmorrhage.

Management of post-partum hæmorrhage. In post-partum hæmorrhage the blood escapes sometimes continuously, sometimes in gushes. Occasionally the hæmorrhage may be entirely internal, when a clot blocks the os uteri; but this is rare. The chief indication in its management is to secure contraction of the uterus. Seize hold of the uterus with the left hand, knead it firmly, and on no account leave go until it is well contracted. Dip the right hand in an antiseptic solution and pass it gently into the vagina and on into the uterus. If the placenta be still there, it should be removed, the hand passing well above it in order to completely separate it. Now the uterus is compressed between the two hands, and bleeding is temporarily arrested. While this is being done an assistant prepares some water at a temperature of from 110° to 120° F., and in a few minutes' time this is injected into the uterus, the hands being still retained in position. Ergot may also be given by the mouth (a teaspoonful of the liquid extract), or injected into the buttock (fifteen minims of the hypodermic solution). If the bleeding do not now cease, the uterus must be packed with iodoform gauze. Transfusion of blood or of saline fluid will be resorted to when the patient is *in extremis*.

General rules for the management of uterine hæmorrhage. The following points should be always kept in mind in dealing with uterine hæmorrhage:—

(1) Keep the patient as still as possible, and forbid the slightest movement.

(2) Prevent all excitement and keep her cool.

(3) Raise the foot of the bed.

(4) Keep the room well ventilated, with a current of air passing through it.

(5) When the hæmorrhage has been checked, watch carefully for a recurrence and try to forestall it.

Most cases of post-partum hæmorrhage can be prevented

by a careful attention to the management of labour. The majority of cases occur from too hasty delivery, especially after tedious labour, and from negligence in securing complete contraction of the uterus as soon as labour is completed. **Prevention of post-partum hæmorrhage.**

The placenta is often retained after birth, from inactivity (inertia) of the uterus, as we have already mentioned. In such a case we wish to stimulate the uterus to complete its work, and this we accomplish by grasping and kneading the organ and by the administration of ergot. **Retained placenta.**

Sometimes the placenta is unduly adherent, and in such cases it may be necessary to introduce the hand, thoroughly antisepticised, into the uterus, and peel it off the uterine wall, at the same time making firm pressure on the uterus with the outside hand. Such cases as these should not be undertaken by the nurse. If some hours have been allowed to elapse, the canals will have become contracted, and it will be necessary to chloróform the patient to dilate them again.

Rupture of the perineum may be complete, involving the anus, or it may only be partial. It is more likely to occur in primiparæ, and in those in whom it has occurred at a previous confinement. Most cases can be prevented by avoiding haste in delivery, and making pressure on the head forwards and upwards through the perineum when rupture is likely to take place. See that the vulva is well dilated before allowing the head to pass through. If rupture have occurred, unless it be entirely slight, a doctor must be sent for, as it is most important that it be repaired without delay. After stitching, the patient must lie quite still on the left side, and the legs must be tied together. The catheter will often require to be used, at any rate for the first few days. The bowels must have careful attention. They should be well moved on the evening of the second day with an enema. If the fæces be allowed to collect and become hard, the stitches will certainly give way. Almost no solid food should be given for the first week. The stitches are removed at the end of from seven to nine days. To promote healing, rest locally, dryness, and perfect cleanliness are absolutely essential. **Ruptured perineum.**

It may be necessary for the patient to undergo an operation for perineal repair at a subsequent date, when

the tear has been a serious one, and healing by first intention has not taken place.

Puerperal fever: a contagious and sometimes an infectious disease.

Probably the most serious complication to which the lying-in woman is liable is puerperal fever. This disease is undoubtedly contagious, inasmuch as it may be transmitted from one lying-in woman to another by actual contact; but it is also, under certain circumstances, infectious—that is to say, it may be conveyed from one woman to another without actual contact, but simply by the air. This has been proved over and over again in the case of the various maternity hospitals, where the disease used from time to time to become so prevalent as to necessitate the temporary closure of these institutions.

Origin.

Puerperal fever is a form of blood-poisoning, which results from the absorption of septic material from some part of the genital tract, either from the interior of the uterus (which, as we have already said, is to be regarded as an open wound), or through a laceration of the cervix, the vagina, or the vulva.

Introduction of poison from within or without.

The poison may be derived from decomposing material in the canal itself—for example, a retained piece of placenta; or it may be introduced from without—for example, by the nurse's or doctor's person or dress, by sponges, instruments, bedding, or diapers. Thus we are accustomed to speak of auto-infection (Gk. *autos*, self) and hetero-infection (Gk. *heteros*, other), according to the source from which the poison is derived. Now, although these two sources have both to be reckoned with, the latter is by far the commoner, except when a portion of placenta remains in the uterus. In other words, the nurse must remember that the poison is nearly always brought to the patient (with the above-mentioned exception), and this will impress upon her the fact that the disease is a preventable one in almost every instance.

A preventable disease.

Period of onset.

As we should expect, the time when this disease is especially likely to occur is during the first three days after confinement, when the interior of the uterus and any wounds in the canal present open and absorbing surfaces, ready to take up any poison which may come in contact with them. After this period the absorptive powers quickly diminish, and the risk of the disease diminishes accordingly.

We have said that the absorption of septic matter is the actual cause of puerperal fever, but in certain cases the liability to it is greater than in others. These are tedious labours, where the woman is exhausted; instrumental labours; and first labours, owing to the frequency of tears in their genital canal. **Predisposing causes.**

The symptoms commence as a rule on the second or third day. There is often a rigor at this time, the pulse becomes rapid and weak, and the temperature may even now be 103° or higher. Upon the intensity of the poison will depend the rapidity of onset and the severity of the disease. There are sometimes a peculiar earthy appearance of the skin and odour of the breath, which are very ominous signs. The patient looks extremely anxious and ill. Other symptoms which are generally present are vomiting, diarrhœa, and a dry, glazed, coated tongue. The lochia are probably very offensive; they are sometimes entirely suppressed. There is often a complaint of pain in the abdomen, and tenderness over the uterus, but by no means invariably so. The patient usually retains her consciousness unimpaired, until perhaps shortly before death. The disease is a very fatal one, the patient usually sinking in the course of a week from exhaustion. **Symptoms.**

The treatment of this malady resolves itself into general and local, but what is of more importance than either of these is its prevention, which we shall first consider. **Treatment.**

Now, the prevention of puerperal fever may be summed up in one word, cleanliness, which must include what we understand as surgical cleanliness—namely, asepsis and antisepsis. **Preventive.**

Not only must the nurse keep her patient clean, the bed and bedding, and the room itself, but she must be most particular about her own person. Remember that the lying-in woman is peculiarly susceptible to any poison, especially that of scarlet fever, and that she has a large raw surface ready to absorb any poison which may gain admission to the genital canal. Now, by free ventilation, thorough attention to antiseptics, and the careful management of every labour in all its details, we may reduce to a minimum the chances of septic absorption.

What applies to the nurse applies quite as much to the doctor, who endeavours to avoid all sources of sepsis in visiting the puerperal woman.

And here let us point out that on no account must a nurse attend another confinement in any capacity, after she has had to do with a case of puerperal fever, until she has had distinct leave from a doctor who knows all the facts of the case. A violation of this rule should be regarded as absolutely criminal.

Management of the disease itself: local and general measures.

The management of the disease itself only concerns the nurse in so far as the actual nursing is concerned.

The first thing the doctor does is to attack the source of the disease by at once washing out the uterus with a strong antiseptic solution, such as perchloride of mercury (1-4000) or carbolic acid (1-40). This may require to be done perhaps three or four times daily until the temperature falls. If there is reason to believe that a fragment of placenta remains, the uterine wall is scraped before its cavity is washed out.

Next, efforts are made to lower the temperature by drugs, especially quinine, and other measures, such as tepid or cold sponging. Above all the strength must be maintained by large doses of brandy and champagne, together with strong beef-tea, beef-jelly, meat-juice, eggs, and milk, for the disease is a most exhausting one.

For pain and sleeplessness an opiate will usually be necessary. Locally, hot stupes or poultices, applied to the abdomen, on which a few drops of laudanum or turpentine have been sprinkled, will give relief, and tend to remove the accumulation of wind (tympanites), which is usually present. The bowels should be freely moved by an enema if they have not acted. Rectal feeding may be required if there be persistent vomiting. Good results have recently been got in a few cases by injecting into the tissues a special serum antitoxin, prepared on the same lines as those used for the treatment of diphtheria and tetanus (see p. 257).

If peritonitis have supervened, abdominal section may be called for. Occasionally puerperal peritonitis occurs independently of puerperal fever.

Puerperal convulsions.

The disease known as puerperal convulsions or puerperal eclampsia is one which is liable to occur during the later months of pregnancy, during labour, or in the puerperium. The convulsions are tonic and clonic in character (see chapter xxvii.), and somewhat resemble those of epilepsy, the

patient losing consciousness. The disease is a very serious one, both to mother and child. It is probably dependent, at any rate in most cases, on deficient action of the kidneys, and is closely associated with the presence of albumin in the urine. On this account it is usual to examine the urine periodically during the later months of pregnancy, especially in the case of primiparæ, in whom the disease is more common.

Symptoms. Among the warning symptoms of an attack are headache, blindness, flashes of light before the eyes, singing in the ears, puffiness of the eyelids, and sometimes dropsy of the hands and the external genital organs. There may, however, be no warning symptoms, the fit being the first indication of the disease. When a convulsive seizure occurs, the eyes become fixed, the eyeballs turned up, the face twisted, the tongue is protruded and may be bitten unless something be placed between the teeth, and the convulsions spread to the whole body. In a few minutes the fit subsides, and the patient gradually regains consciousness, or another fit may quickly supervene, and death occur.

In estimating the gravity of an individual case we have regard, among other points, to (1) length of time the patient is comatose, (2) depth of the coma, and (3) rapidity with which the convulsions follow each other.

Treatment. The treatment is both preventive and curative. When the warning symptoms lead us to suspect the disease, we endeavour to prevent an attack by relieving the work of the kidneys. **To ward off an attack.** An entire, or almost entire, milk diet is ordered; free action of the skin, either by drugs or baths, or both, is induced; and the bowels are kept freely open.

If a fit be in progress before the doctor's arrival, the nurse must manage it as she would an epileptic fit (see p. 177). The doctor gives chloroform as long as the fit lasts; and as soon as it is over he uses means to induce copious sweating and to procure a free action of the bowels. To favour sweating the patient should be wrapped up in warm blankets, and sometimes a vapour bath is given in addition. To quieten the patient an enema of chloral and bromide of potassium is sometimes given. As a last resource in severe cases bleeding (venesection) is performed, sometimes with marked benefit.

If a fit occur during labour, delivery is effected as quickly

as possible. If labour has not commenced, it is generally induced as soon as the fit has subsided.

Puerperal mania. There is a form of insanity connected with child-birth called puerperal mania. Although it may occur before or during labour, it is much more commonly met with during the puerperium (hence the name), especially during the first four days.

Causes. Among other causes which may influence an attack heredity plays an important part, and the possibility of its occurrence must not be lost sight of in those who inherit such predisposition.

Forms of insanity. Mania is the most common form immediately following labour; melancholia is more frequent during pregnancy and lactation. Suspicious signs are sleeplessness, sulkiness, and indisposition to properly nurse the child. Remember that it may occur suddenly. Recovery usually takes place within six months, and is generally complete.

Management. The nurse must not leave the patient alone. She must use no restraint towards the patient, except in so far as it may be necessary to prevent her damaging herself or her child. Sometimes artificial feeding may be necessary, and the patient may require to be sent to an asylum. The strength must be supported, plenty of nourishment given at frequent intervals, and the bowels kept freely open. Drugs may be required to quieten the patient.

Phlegmasia dolens. Phlegmasia dolens, commonly known as white-leg, is a complication of the puerperium requiring brief mention. The disease consists of a swelling of the lower limb, generally the left, which is often associated with, if not caused by, a clotting of the blood in the femoral vein, which obstructs the venous return from the limb.

Occurrence. It most commonly occurs in the second week of the puerperium, although it may occur in pregnancy, and indeed apart from child-birth altogether.

Symptoms. There are usually some signs of slight fever for a few days before the leg becomes actually affected—symptoms, in fact, of mild septic absorption. This is followed by an attack of pain down the front of the thigh or in the calf of the leg, and sometimes the inflamed vein can be easily felt: the vein should, however, be handled very carefully, or else a fragment of clot may be separated, and be carried by the circulation to other parts, and set up mischief elsewhere

(embolism). As the leg swells the skin becomes tightly stretched and white in colour, and has a shiny appearance like marble (marble-leg). The disease lasts from three to six weeks, and may be complicated or followed by various affections, one of which we have already mentioned.

Management. The treatment is both local and general. The leg must be kept at rest, lying on a pillow, with the lower end raised, either in the bent or straight position, as is most comfortable. The weight of the bed-clothes must be removed by means of a cradle. The limb may be wrapped up in hot fomentations or in cotton-wool, on which is sprinkled lead-and-opium lotion when the pain is severe. Later on, when the acute symptoms have subsided, gentle friction and massage, stimulating liniments, and bandaging with a light flannel bandage are prescribed. The patient must be content to rest entirely for some considerable time after acute symptoms have disappeared.

General treatment includes the relief of constitutional symptoms, such as pain, fever, and the general debility which is so often present. At a later stage tonics are prescribed. A nourishing diet is necessary, and alcohol is often ordered to support the strength.

CHAPTER XXIX.

GYNÆCOLOGICAL CASES.

Many of the illnesses to which women are liable are referable, directly or indirectly, to the reproductive organs; and the nurse cannot fail to meet with these cases frequently in her work.

Commoner symptoms of diseases peculiar to women. It will be advisable to point out the commoner symptoms to which these diseases give rise before considering the methods employed for their detection and treatment.

Menstrual irregularity. The first sign to which we shall refer is irregularity of menstruation. The monthly flow may be modified in at least three ways, but in estimating such modification attention must be paid to what customarily happens in health; for women differ very considerably in what we speak of as their menstrual habit—that is to say, the length of each period and the quantity lost each month. The flow may be diminished in amount or entirely suppressed; again, the colour of the blood lost may be very pale. Next, there may be an increase in the flow and the period over which it lasts. An excessive loss is sometimes spoken of as "flooding." Menstruation should not be accompanied by severe pain; yet, even in health, some women undoubtedly suffer very considerably at this time, and painful menstruation is very common. It is really a question of degree; what one woman would characterise as painful menstruation another would pay little attention to. The monthly period may, then, be altered in these three ways. Lastly, there may be an intercurrent loss of blood—that is to say, a loss between the periods. This is an important sign when it occurs about the time of the menopause, or "change of life."

Pain in the back and bearing down. Pain in the back is a frequent complaint in many gynæcological cases, also a sense of bearing down or weight in the pelvis.

Another common symptom is vaginal discharge, commonly known as "whites." This the nurse must pay attention to, so as to be able to explain to the doctor its character. Any vaginal discharge except that which occurs during menstruation is abnormal, although women frequently pay little or no attention to it. **Vaginal discharges: three varieties.**

We shall mention three varieties: (1) A white mucous discharge, which comes from the upper part of the uterus, and is very profuse in uterine inflammations. It is alkaline in reaction. (2) A gelatinous, sticky, transparent discharge, which comes from the cervix, and which normally is only sufficient in amount to block up the mouth of the uterus. It is also alkaline, but, unlike the uterine secretion, it is sticky. (3) A mucous discharge, which is acid in reaction and not sticky: this comes from the vagina itself, and is seen covering pessaries and all applications put into the vagina. Note, then, that the sources of vaginal discharge may be (1) the uterus, (2) the cervix, and (3) the vagina. **Uterine.** **Cervical.** **Vaginal.**

Lastly, there may be complained-of troubles referred to the rectum and bladder, arising frequently from pressure of the displaced uterus. For the detection of this class of diseases a vaginal examination is often necessary. **Rectal and bladder troubles.**

The nurse must understand how to prepare the patient and what to get ready for the doctor's use. When opportunity offers, the rectum must be emptied and the external genitals cleansed. She should always remain in the room unless requested by the doctor to withdraw. **Preparation for a vaginal examination.**

It is usual to examine patients in one of two positions in this country—namely, either on the left side (left lateral) or on the back (dorsal). **Positions adopted.**

The nurse must see that access is made easy. In the former position the patient lies on her left side, with the legs drawn up, near the edge of the bed. A modification of this position is that known as the semi-prone or Sims's position, which is used when the duck-bill or Sims's speculum is introduced. The patient lies almost on her chest; the left arm hangs behind her over the edge of the bed or couch, while the right knee is brought well over the left, so that its inner surface touches the couch. **Left lateral.** **Semi-prone position.**

For the dorsal examination the patient lies on her back, with the knees bent and the legs separated, the clothes being loosened as before. **Dorsal position.**

The nurse must be careful to avoid all unnecessary exposure. A good plan to adopt is to cover the body from the hips downwards with a single sheet. In the dorsal position each leg should be covered separately when it is required to inspect the external genitals. When the left lateral position is used, the patient is turned on to her back after vaginal examination, so that the combined abdominal and vaginal examination (bimanual) may be made. After vaginal examination, or it may be instead of it, a rectal exploration is sometimes made.

Genu-pectoral or knee-chest position.

Occasionally another position is made use of: this is the knee-chest or genu-pectoral position. The patient lies with the hips raised and the chest flat on the bed: the weight of the body falls on the knees. In this posture the contents of the abdomen gravitate downwards towards the diaphragm.

For a digital examination nothing more than a little vaseline, oil, or other lubricant will be required. It is often necessary to obtain a view of the vagina and cervix uteri, and for this purpose a speculum is used. Those in common use are two—namely, the tubular (Fergusson's) and the duck-bill (Sims's). There are, however, many other varieties. When the speculum is required, heat it by holding it for a moment in warm (not hot) water, and then oil its outer surface. The duck-bill speculum requires to be held in position by an assistant, while the tubular speculum is self-retaining, or at any rate easily kept in position without assistance.

Speculum: two varieties.

Other instruments in common use.

Other instruments that are commonly required, both for diagnosis and treatment, are the uterine sound, probe, curette, dilators, and volsellum, with all of which the nurse should make herself familiar.

Various appliances known as pessaries are used to keep in place a displaced uterus. These are made of india-rubber, vulcanite, or other material. They should be oiled before being introduced.

"Dressing" of sounds and probes.

A sound or a probe may be used to cleanse the interior of the uterus or to apply various substances to its walls or to the cervix. For this purpose they require to be "dressed." This the nurse must know how to do. It takes a little practice to dress a sound well. Take a thin film of cotton-wool about two and a half inches square, and lay it on the

palm of the left hand. Wet the end of the sound as far as the first knob (two and a half inches), and lay it firmly on the wadding. Now close the hand and turn the sound round three times till the wool is tightly and evenly rolled on. In order to remove the wool from the sound it should be unrolled under water. When an application has to be made to the interior of the uterus or cervix, several dressed sounds or probes should be prepared. The first sound, or perhaps more than one, is passed dry, in order to cleanse the parts of mucus or blood. The others should be dipped in the required substance (often carbolic acid, iodine, or a mixture of the two), and handed, one after the other, as required.

Vaginal tampon or plug. After such applications and under other circumstances the vaginal tampon or plug is used. This may be medicated or not. It is made as follows :—Take a piece of absorbent cotton-wool about the size of the palm of the hand, and fold up the corners towards the centre. Round its centre tie a piece of thread at least eight inches long. Glycerine is frequently used to saturate the plug. This is done by pouring a tablespoonful into the centre of the wool before wrapping up its corners. The glycerine plug is generally left in about twelve hours. It sets up a watery discharge, so that the patient must wear a diaper. The non-medicated vaginal plugs should be smeared over with vaseline to facilitate introduction.

It may be necessary to plug the vagina in cases of severe hæmorrhage—as, for example, in cancer of the uterus. Under these circumstances the pledgets of wool should be soaked in carbolic oil, and gently but firmly packed into the vagina.

Vaginal douche. The vaginal douche is much used in gynæcological practice. For this a Higginson's syringe may be used; but what is more convenient, because the patient can manage it herself, is the douche-can and tube or a modification thereof.

Douche-can. The can is filled and hung up on the wall or placed on a chest of drawers or table at a higher level than the bed. Connected with its lower end is a piece of rubber tubing, having a vaginal tube at its end, on which is placed a tap to regulate the flow. **Syphon-tube.** Or else the syphon-tube can be used as shown in fig. 73. A long piece of rubber tubing

has at one end a large hollow sinker, which is dropped into the vessel containing the fluid. A piece of glass tubing, suitably bent, is inserted where the tube passes over the edge of the vessel to make it rigid. The other end of the tubing carries the vaginal tube as before.

Position to be adopted for vaginal douche. The patient should lie on her back, with the hips raised to a level considerably higher than the shoulders. A vessel must be placed underneath her to receive the overflow. In introducing the tube care must be taken that it is not too hot and that it reaches to a point behind the cervix before the douche is commenced. The fluid used may be simply warm or hot water, or it may contain some medicament, such as Condy's fluid, carbolic, perchloride of mercury, alum, or sulphate of copper. As a rule the water should be as hot as the patient can bear it, always so in inflammatory cases. It may be comfortably warm when used for purposes of cleanliness.

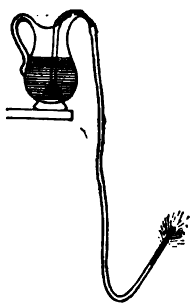


FIG. 73.—SYPHON-DOUCHE (HART AND BARBOUR).

Uterine douche. The uterine douche has to be used with great care, and this is seldom or never given by the nurse. The reason for this is that the use of any force may send the fluid through the Fallopian tubes into the peritoneal cavity. To avoid this the cervix must first be sufficiently dilated to admit the finger, and the tube used must not entirely fill the cervical canal, so that free exit of the fluid may be ensured.

We may now pass very briefly in review some of the commoner diseases peculiar to women.

Diseases of the ovaries: inflammation. The ovaries may be the seat of inflammation (ovaritis), acute or chronic. This is often due to a chill at the monthly period. Other common causes are child-birth and abortion.

Symptoms. Pain is generally complained of, referred to one or both sides, or occasionally to other parts, such as the back, and there is tenderness over the affected parts. Sometimes there is a rise of temperature, together with other signs of moderate fever.

In acute cases hot vaginal douching and blisters or other form of counter-irritation over the inflamed organs are prescribed. It may be necessary to give sedatives to ease pain and procure rest. In chronic ovaritis the glycerine plug is generally used. **Management.**

The ovaries may be the seat of tumours, fluid or solid in consistence. We have already spoken of the operation of ovariotomy, which is undertaken for their removal (see chapter xix.).

One of the commonest of gynæcological affections is inflammation of the lining membrane of the uterus. This may be acute or chronic: in the former case the body of the uterus and the cervix are both affected; in the latter case they are usually attacked separately, the cervical inflammation (cervical catarrh) being far more common than inflammation of the body of the uterus (endometritis). This is due to at least two reasons: (1) the cervix is liable to be irritated by discharges from the uterus or by the spread of inflammation upwards from the vagina, and (2) the damage which the cervix is so apt to receive during labour predisposes it to inflammation. **Uterine inflammation cervical catarrh.** **Endometritis.**

Among the numerous causes, in addition to child-birth and abortion, may be mentioned exposure to cold, especially just before the menstrual period, the incautious use of instruments, tumours, and displacements of the uterus. Menstruation is irregular, and there is often an excessive loss, pain in the back, vaginal discharge (leucorrhœa), and more or less constitutional disturbance. **Causes.**

The treatment embraces general and local measures. Included under the former are attention to general health, light nourishing food, tonics, and change of air. We have already mentioned some of the local measures—namely, douching, the application of various substances to the interior of the uterus by means of a "dressed" sound or probe, and the use of vaginal plugs. An operation for a laceration of the cervix may be required. **Treatment.**

Two tumours of the uterus require mention—namely, (1) the fibroid and (2) cancer. **Tumours of the uterus.**

The fibroid tumour is very common, especially between the ages of thirty and forty-five. It gives rise to various symptoms, depending very much on its position: it may grow outwards from the uterus; or it may remain embedded **Fibroid tumour.** **Its position with regard to the uterus.**

in the muscular substance which composes its wall; thirdly, it may project into the uterine cavity. The last named is the most important variety, since it is that which causes the most severe symptoms. The most serious symptom is hæmorrhage, which may be very profuse.

Treatment. The treatment is divided into medical and surgical. Many of these tumours require no surgical interference. Various operations are performed either for their removal or else with a view to arrest their growth. After the menopause, which is, however, usually delayed, they generally tend to shrink.

Fibroid tumours do not endanger life except by the symptoms, especially hæmorrhage, to which they may give rise.

Cancer of the uterus. Cancer of the uterus is nearly always located in the cervix, while the fibroid tumour is situated in the body of the organ. Cancer of the uterus is a disease which invariably proves fatal sooner or later unless it be removed, and this can only be done at an early period in its course.

Importance of its early detection. Hence the importance of an early diagnosis. The nurse can sometimes be of service in bringing cases of cancer to the doctor early by a knowledge of the symptoms of the disease.

Period of occurrence. It is a disease which principally affects the married, and frequent child-birth has an important influence on its occurrence. The commonest period is between the ages of forty-five and sixty-five.

Important symptoms. There are four important symptoms: these are hæmorrhage, offensive discharge, pain, and loss of flesh with increasing weakness.

Hæmorrhage. Any woman who has hæmorrhage from the vagina after the change of life should at once consult a doctor, as this is a suspicious sign of cancer. The same applies to hæmorrhage between the menstrual periods (irregular hæmorrhage) in middle life.

Vaginal discharge. Sometimes the fœtor of the vaginal discharge is almost diagnostic of cancer. When the growth has begun to ulcerate, this fœtor develops, and the discharge becomes of a reddish-brown colour.

Pain. Pain is not usually an early symptom. It is described as a gnawing pain in the back, or as a sharp, shooting pain. It is often periodic, coming on at a particular time each day.

The emaciation and debility become extreme as the disease progresses, and the face often assumes a characteristic care-worn, gaunt appearance, and there may be a duskiness of the skin. In course of time the disease may spread forwards to involve the bladder and backwards to the rectum, giving rise to pain on passing water and when the bowels act. If ulceration into the bladder or rectum occur, the urine and fæces will be passed in part or in whole by the vagina.

Emaciation and debility. **"Cancerous expression."** **Spread of the disease to the bladder and rectum.**

The treatment depends on whether or not the case is fit for operation. If an operation is to be performed, its extent will be defined—whether, for example, the disease be scraped away or the cervix or the whole uterus be amputated (see p. 202). We shall speak here merely of palliative treatment, the relief of symptoms.

Treatment: operative and palliative.

Hæmorrhage is kept in check by ergot, either given by the mouth or injected under the skin, and by various local measures, such as injections into the vagina of cold or hot water, and ice passed into the vagina. If it be profuse, the vagina must be firmly plugged in the way we have mentioned. A tampon soaked in perchloride of iron is sometimes introduced into the vagina, so as to come into contact with the bleeding surface.

Management of hæmorrhage.

The management of the discharge will often tax the nurse's resources. The various antiseptic and astringent douches are best suited to overcome its offensiveness, which, once experienced, can never be forgotten. The discharge must be made and kept sweet. Keep the skin round the vagina protected by a soothing lotion of olive oil and glycerine from the irritating discharges. A good plan to keep the room sweet in offensive cases is to hang charcoal in bags round the bed, or else to gently heat a few crystals of iodine until a few violet fumes are given off; or, again, cascarilla chips or simply brown paper may be burnt. A plentiful supply of tow will be found both useful and economical in keeping the patient clean and comfortable.

Management of discharge.

Pain can only be relieved in the later stages by opium or morphia. The patient must be gradually made an opium-eater. Its administration is postponed as long as possible. It is given by the mouth, hypodermically, or as a suppository.

Management of pain.

Lastly, the general condition of the patient must be

General considerations.

noted: a nourishing dietary, cheerful companionship and surroundings, and well-ventilated rooms are all important.

We always tell a patient she has not cancer when our examination permits us to do so; but it is generally agreed that it is kindest and wisest not to tell the patient when she has the disease—at any rate, the nurse must be careful not to use the word in the patient's hearing.

Uterine displacements.

We have already said (see p. 361) that the uterus is a movable organ in health. This movement may become increased, so that the organ comes to be displaced forwards, backwards, or downwards. Such a condition requires to be remedied by replacing the organ and using some appliance to keep it in its proper position. Especially does this refer to displacements backwards and downwards.

APPENDIX.

It will be convenient here to describe briefly certain appliances with which every nurse should be familiar. We have already had occasion to refer to these in the course of this work.

Cold Compresses.—Several folds of linen or other material are wrung out of cold water or the lotion (if such has been ordered), and over them is placed a piece of gutta-percha tissue, or, if not at hand, a piece of dry linen. To be of any value they should be changed frequently.

Wet Pack.—Arrange, when possible, a second bed alongside that in which the patient is lying. Strip the patient and envelop his body in a wet sheet, placing a blanket over him and tucking it well in. Apply for from half to one hour, watching the temperature, and stopping when the thermometer in the mouth reaches a point a couple of degrees higher than that to which it is desired to reduce the temperature (see p. 337).

Ice-bags.—These should not be more than half full. See that the ice is fresh and broken into small pieces, and do not let their full weight rest on the patient. Except in the case of the unshaven head, do not apply directly to the surface of the body, but let a layer of lint intervene, and keep this as dry as possible. Ice-bags must not be left on when the ice has melted, since the temperature of the water in the bag soon rises, and the good effects of the cold are counteracted. In the case of wounds of the lower limb little bags of ice may be suspended from the cradle.

Hot-air Baths.—A cradle is placed in the bed, and a piece of mackintosh under the blanket, on which the patient lies stripped. The apparatus is placed at the foot of the bed, and the hot air is conducted by means of a pipe into the bed. Over him is placed a blanket, which must be well tucked in all round to prevent the escape of the hot air. This is kept up generally for about twenty minutes. Let the patient perspire freely. The temperature is regulated by a thermometer suspended from the cradle, and may range from over 100° to 150° F. After removing the apparatus, let the patient cool for a few minutes, and then dry him well and wrap him in a dry blanket.

In the case of a vapour bath steam replaces the hot air, and the temperature must consequently be much lower. It is seldom higher than 110 F.

Fomentations.—These are best made of coarse flannel, but lint or spongiopiline may be used. The fomentation should be wrung out of boiling water as dry as possible by means of a wringer. Apply as hot as possible, and cover with a piece of jaconette and a layer of cotton-wool, in order to retain the heat and to keep the patient dry. Fomentations should be changed from every quarter to half an hour, and another should be ready to replace the cool one before it is removed. Certain drugs are sometimes sprinkled on the fomentations before applying them: for example, turpentine, laudanum, belladonna, and chloroform. Not more than a couple of teaspoonfuls of turpentine should be used, since it is a powerful irritant, and is apt to blister the skin.

Poultices.—The most common material used for making poultices is linseed meal; but other substances, such as bread, mustard, starch, and charcoal, may also be employed. The following are required for making a linseed poultice: a kettle of boiling water, linseed meal, a board or heated plate, a spatula with which to spread the poultice, tow or old linen, a poultice-bowl, an ordinary basin, and perhaps also a little olive or other sweet oil. Put some boiling water into the poultice-bowl and heat the spatula. Then prepare the tow or linen according to the size required. Next empty the poultice-bowl and put in the requisite quantity of boiling water (this can only be learnt by experience). Now sprinkle the linseed into the water, stirring

the mixture with the other hand, always in the same direction, until a thick paste is formed. The paste is now quickly spread on the tow or linen evenly, to the thickness of about half an inch, leaving a margin of an inch and a half to fold over. Dip the spatula frequently into hot water to prevent the linseed sticking to it. When finished, a few drops of oil or glycerine may be smeared over the poultice to prevent it sticking to the skin, or a layer of muslin may be spread over it. Apply it as hot as can be borne, but be careful not to burn the skin. Do not make poultices too heavy, and never re-heat a poultice. If it has to be taken to another room, place it between two hot plates. Do not keep on too long, and never change till a fresh one is quite ready. To make a bread poultice stale bread is boiled for a few minutes with a little water, which is then drained off. The swollen bread is spread on linen, and oil is smeared over it, or else it will become dry and stick to the patient.

Counter-irritation signifies the production of an irritation which may or may not amount to an actual inflammation of the skin, by which a beneficial effect is exerted on a diseased tissue below the surface of the body. This may be produced by various means, such as cupping, dry and wet, the use of leeches, and blistering.

Cupping.—For this there are required cupping-glasses of various sizes, blotting-paper, methylated spirit, a little oil, and a scarifier. The air is exhausted from the cupping-glass by placing a piece of blotting-paper wetted with a few drops of spirits of wine in the bottom of the glass, and then igniting it. The glass should first be warmed. Now apply quickly to the selected spot, first smearing the edges with the oil. The skin swells up within the glass. Raise one edge of the glass with the finger-nail when it is wished to remove it. This constitutes dry cupping. In wet cupping a scarifier is first applied to the spot, whereby several minute cuts are produced; the cupping-glass is then applied as in dry cupping, when a certain quantity of blood is drawn into the glass. This is usually practised on the loins when it is desired to act on the kidneys. The wounds produced in wet cupping are covered with a dry dressing.

Leeches.—These remove a small quantity of blood

Wash the skin over the selected spot; wipe the leech, and hold it by its larger end, when it will generally "take hold" by its head or smaller end, if this is held over the spot where it is wished to apply it. Another method is to put it in a wine-glass, and then to turn the glass upside-down over the site. Let the leech hang on as long as it will, and do not drag it off. Then place it in a vessel containing a little salt, when the blood is vomited up. The leech-bites are washed and covered with cotton-wool. If oozing be troublesome, a little ice will usually stop it; but occasionally it cannot be checked, when medical advice must be obtained. Elderly people should be watched more especially after the use of leeches. Never apply a leech over a large blood-vessel.

Blistering.—Here the cuticle or "scarf-skin" becomes separated from the true skin by a layer of fluid, the result of the inflammatory action produced by the blistering-agent. Blistering may be set up by a blistering-plaster, or, better still, by blistering-fluid (liquor epispasticus). When using the latter, its area of application must be clearly defined. In using blistering-plasters, secure with a bandage or wrapper, and not with sticking-plaster. The time required for the blister to rise varies from six to twelve hours. Its progress must be carefully watched. If slow to rise, heat applied to the spot—for example, in the form of a poultice—will hasten the process.

To dress the blister take a pair of sharp-pointed scissors, and snip the bleb at its lowest point, and catch the fluid in wool, or in a receiver, if it is required to keep it for examination. Now let the raised cuticle fall back, and dress with a simple dressing, such as zinc or boracic ointment spread on lint, and covered with a piece of wool and a bandage. If it be desired to keep the blister open, remove the cuticle, and carefully apply the irritant ordered.

Massage consists in certain systematic and purposive manipulations applied to the muscles, joints, and other parts, which cannot be satisfactorily learnt from a book. The indications for its use are numerous: these include certain medical cases, such as hysteria and neurasthenia; and some surgical affections—for example, various inflammatory thickenings, and sometimes cases of stiff joints.

ENEMATA.—These vary in the object for which they are given. They may be used, for example, (1) to produce an evacuation of the bowels, (2) to check diarrhœa or dysentery, (3) to nourish the patient (nutrient enemata), (4) to kill thread-worms (anthelmintic).

(1) Purgative enemata must be copious. About a pint of warm water, containing sufficient soap to make a lather, forms the simple enema. Drugs, such as glycerine, castor oil, olive oil, or turpentine, may be added to it, in which case they should be injected first, mixed with a small amount of the enema, to be followed by the bulk of the injection. Higginson's rubber syringe answers best to give this class of enema. Let the patient lie on his left side close to the edge of the bed with the knees drawn up, squeeze the air out of the syringe, oil the nozzle, and insert for two inches into the bowel, using no force. Inject the fluid steadily and slowly. Press the anus after giving the enema, and tell the patient to lie as still as possible, and to try and retain it as long as he can. Have the night-stool or bed-pan at hand.

(2) Enemata to check diarrhœa are generally used cold or almost cold, and in small bulk, from two to three ounces. The usual basis is starch, to which is added laudanum in the quantity ordered. Remember that laudanum should be used with the greatest possible care in children, who always bear opium badly. Give these enemata with a glass syringe.

(3) Nutrient enemata. We have already referred to this class of enema when speaking of artificial digestion (see p. 83). See first that the lower bowel is empty. The injection should be given at a temperature of 100° F., not oftener than every three or four hours, and the bowel should first be washed out with warm water. Use a ball-syringe, to which a No. 12 gum-elastic catheter is attached by means of a piece of tubing. Insert the catheter well into the rectum.

(4) Enemata to kill thread-worms contain half an ounce of salt in about a pint of water or other basis, or half an an ounce of turpentine mixed with the yolk of an egg in half a pint of water.

INDEX.

A.

B.

D.

E.

F.

T.

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